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Metals Review

The News-Digest Magazine

Published by the American Society for Metals

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SCIENCE & TECHNOLOGY

October 1959

John Leland Atwood
1959 A.S.M. Achievement Award
(See Article, p. 4)

The 14th METALLOGRAPHIC EXHIBIT

Chicago, November 1 to 6, 1959

All metallographers—
everywhere—
are cordially invited to
display their best work.

RULES FOR ENTRANTS

Exhibitors do not need to be members of the American Society for Metals.

Work which has appeared in previous metallographic exhibits held by the American Society for Metals is unacceptable.

Photographic prints should be mounted on stiff cardboard, extending no more than 3 in. beyond edge of print in any direction; maximum dimensions 14 by 18 in. (35 by 45 cm.). Heavy, solid frames are unacceptable.

Entries should carry a label on the *face of the mount* giving:

Classification of entry.

Material, etchant, magnification.

Any special information as desired.

The name, company affiliation and postal address of the exhibitor should be placed on the *back of the mount* together with a request for return of the exhibit if so desired.

Entrants living outside the United States should send their micros by first-class letter mail endorsed "Photo for Exhibition—May Be Opened for Customs Inspection".

Exhibits must be delivered before Oct. 15, 1959, either by prepaid express, registered parcel post or first-class letter mail, addressed:

Metallographic Exhibit
American Society for Metals
53 W. Jackson Blvd.
Chicago 4, Ill., U.S.A.

CLASSIFICATION OF MICROS

Class 1. Cast irons and steels
Class 2. Carbon and alloy steels (wrought).
Class 3. Stainless steels and heat resisting alloys.
Class 4. Aluminum, magnesium, beryllium, titanium and their alloys.
Class 5. Copper, nickel, zinc, lead and their alloys.
Class 6. Uranium, plutonium, thorium, zirconium and reactor fuel and control elements.
Class 7. Metals and alloys not otherwise classified.
Class 8. Series showing transitions or changes during processing.
Class 9. Welds and other joining methods.
Class 10. Surface coatings and surface phenomena.
Class 11. Slags, inclusions, refractories, cermets and aggregates.
Class 12. Electron micrographs.
Class 13. Results by unconventional techniques.
Class 14. Color prints in any of the above classes. (No transparencies accepted.)

AWARDS AND OTHER INFORMATION

A committee of judges will be appointed by the Metal Congress management which will award a First Prize (a medal and blue ribbon) to the best in each classification. Honorable Mentions will also be awarded (with appropriate medals) to other photographs which in the opinion of the judges closely approach the winner in excellence. A Grand Prize, in the form of an engrossed certificate and a money award of $500 from the Adolph I. Buehler Endowment will also be awarded the exhibitor whose work is judged best in the show, and his exhibit shall become the property of the American Society for Metals for preservation and display in the Society's national headquarters.

All prize-winning photographs will be retained by the Society for one year and placed in a traveling exhibit to the various Chapters.

41st NATIONAL METAL CONGRESS & EXPOSITION

INTERNATIONAL AUDITORIUM — — — CHICAGO — — — NOV. 1 to 6, 1959

Metals Review

The News Digest Magazine

October, 1959
Vol. XXXII, No. 10

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G. H. Loughner, Production Manager

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Published monthly by the American Society for Metals, Metals Park, Novelty, Ohio: C. H. Lorig, President; Walter Crafts, Vice-President; R. H. Aborn, Treasurer; W. E. Jominy, Secretary; John H. Hollomon, E. E. Stansbury, Earl Parker and M. A. Scheil, Trustees; G. M. Young, Past President. Subscriptions $6.00 per year ($7.50 foreign). Single copies $1.50. Entered as Second Class Matter, July 26, 1930 at the Post Office at Cleveland, Ohio, under the Act of March 3, 1879.

Claims for missing numbers will not be allowed if received more than 60 days from date of issue. No claims allowed from subscribers from overseas, or because of failure to notify the circulation department of a change of address or because copy is "missing from files".

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John Atwood Awarded Medal for Advancement of Research

For his "constant endeavors on behalf of research and for his keen foresight in gaging the needs of aircraft and missile technology", John Leland Atwood, president of North American Aviation, Inc., has been chosen to receive the A.S.M. 1959 Medal for the Advancement of Research. President Clarence H. Lorig will confer the honor during the Society's Annual Banquet, Thursday, Nov. 5, in the Hotel Sherman.

President of North American since 1948, Mr. Atwood joined the firm in 1934 as chief engineer and vice-president. He became assistant general manager in 1938 and first vice-president in 1941.

He also heads Astrodyne, solid rockets propellants concern formed in 1958 by North American and Phillips Petroleum Co., and he is also a director of the Pacific Indemnity Co.

The citation accompanying the medal's presentation will salute Mr. Atwood's and North American's contribution to the development of chemical milling and electrochemical milling, pioneering in the use of titanium and important work in improvement of forming methods.

John Atwood, a native of Walton, Ky., obtained his A.B. degree in 1926 from Hardin Simmons College and a B.S. degree in civil engineering from the University of Texas in 1928. He was awarded an Honorary Doctorate in 1955 by Stevens Institute of Technology.

He began his career as a junior airplane engineer with the Army Air Corps at Wright Field, Dayton, Ohio, in 1928, leaving that position to become a design engineer with Douglas Aircraft Co. in Santa Monica, Calif., in 1930. Headquarters of North American Aviation, Inc., is at Los Angeles, Calif.

Bain to be Made Honorary Member at Metal Show

Honorary Membership in the American Society for Metals, in recognition of his lifetime of service to science and industry, will be conferred upon Edgar C. Bain at the Annual Banquet of the A.S.M. on Nov. 5, during the National Metal Congress.

Dr. Bain, who retired two years ago as assistant executive vice-president—operations, U. S. Steel Corp., joined the corporation in 1928 as head of the metallurgical department in the then new research laboratory at Kearny, N. J.

He served there until 1935, when he became assistant to the vice-president—research and technology. In 1943 he was named vice-president—research and technology, of Carnegie Illinois Steel Corp., and retained that title in U. S. Steel upon its reorganization in 1952. He was assistant executive vice-president—operations, from 1956 until his retirement.

A 1912 graduate of Ohio State University, Dr. Bain's early career included service with the National Bureau of Standards as a chemist, graduate work and teaching at Ohio State and the University of Wisconsin and as a chemical engineer with B. F. Goodrich Rubber Co.

He also was a metallurgist with General Electric Co. and Atlas Steel Corp. and Union Carbide and Carbon Research Laboratories.

Dr. Bain's major accomplishments include important contributions concerning steel heat treatment and alloying elements in steel. His publications on isothermal transformation are regarded as landmarks.

He is the holder of many honors, including the American Society for Metals' Albert Sauveur Achievement Award, which he received in 1946. He was the 1936-37 president A.S.M. He is also a member of the National Academy of Sciences.

One of the major buildings of U. S. Steel's Research Center at Monroeville, Pa., is named the Edgar C. Bain Laboratory of Fundamental Research in his honor.

To Get A.S.M. Teaching Award at Luncheon

Winner of A.S.M.'s $2000 Teaching Award for 1959 is Walter A. Backofen, associate professor of metallurgy at Massachusetts Institute of Technology.

The cash award will be presented at the Society's 4th Annual Awards Luncheon, on Tuesday, Nov. 3, in Hotel Sherman, Chicago. Prof. Backofen received his S.B. in metallurgy from M.I.T. in 1946 and his ScD. in 1950. He was named an assistant professor upon receiving his doctorate and became an associate professor in 1957.

His special field of interest is metals processing. He is particularly interested in deformation and fracture and he is conducting a number of research programs in these areas with graduate students.

Three to Share Howe Award at Metal Congress

For their joint authorship of a significant research paper, three University of California metals scientists will share the American Society for Metals' Henry Marion Howe Award for 1959.

Winners of the oldest award of the 30,000-member Society are John E. Dorn, professor of metallurgy, and Frank E. Hauser, assistant professor of mechanical engineering, both of the University of California at Berkeley, and Philip R. Landon, research metallurgist with UC's Lawrence Radiation Laboratory at Livermore, Calif.

A.S.M.'s Transactions Committee selected as outstanding their paper on "Deformation and Fracture of Alpha Solid Solutions of Lithium and Magnesium". It will be presented during the 41st National Metal Exposition and Congress, Nov. 2-6, at Chicago.

Prof. Dorn, who received his B.S. and M.S. degrees from Northwestern University and his Ph.D. from University of Minnesota, has been professor of metallurgy at the University of California since 1952. He previously held associate professorships there in mechanical engineering and physical metallurgy. A Chicago native, he was a research metallurgist for Dow Chemical Co. in 1941. In 1936-38 he was a post-doctoral research fellow at Battelle Memorial Institute, Columbus, Ohio.

Dr. Dorn is author of more than 90 scientific publications, most in the area of mechanical metallurgy.

German-born Dr. Hauser has been an assistant professor of mechanical engineering at Berkeley since 1956. He received his B.S., M.S. and Ph.D. degrees at the same institution he now serves.

Dr. Hauser's research specialties have included the fields of high deformation rates—impulsive loading, creep recovery, and deformation and fracture of magnesium-lithium alloys.

Prof. Landon received his A.B. and M.S. degrees at the University of California, Berkeley, and has been attached to the Radiation Laboratory since 1957.

He currently is working on metallurgical research and development in connection with Project Pluto, a program for nuclear ramjet propulsion systems.

MAKE A DATE FOR DALLAS

Second Southwestern Metal Exposition and Congress Will be Held in

Dallas . . .

May 9-13, 1960

A.S.M. Special Activities Program
NATIONAL METAL CONGRESS
NATIONAL METAL EXPOSITION
Chicago, November 1-6, 1959, Hotel Sherman

SPECIAL EVENTS

BATTELLE ALUMNI HOUR
5:00-7:00 p.m.—Monday, Nov. 2
Hotel Sherman

ARMOUR RESEARCH FOUNDATION LUNCHEON
12:00 noon—Monday, Nov. 2
Hotel Sherman

A.S.M. AWARDS LUNCHEON
12:00 noon—Tuesday, Nov. 3
Grand Ballroom, Hotel Sherman

A.I.M.E. ANNUAL DINNER
6:30 p.m.—Tuesday, Nov. 3
Ballroom, Hotel Morrison

CANADIAN LUNCHEON
11:30 a.m.—Wednesday, Nov. 4
Crystal Room, Hotel Sherman

COLLEGE ALUMNI LUNCHEONS
12:00 noon—Wednesday, Nov. 4
Hotel Sherman

Carnegie Institute of Technology
Case Institute of Technology
Cornell University
Fenn College
Illinois Institute of Technology
Lafayette College
Lehigh University
Massachusetts Institute of Technology
Michigan College of Mining and Technology
Michigan State University
Missouri School of Mines and Metallurgy
New York University
Ohio State University
Pennsylvania State University
Polytechnic Institute of Brooklyn
Purdue University
South Dakota School of Mines and Technology
Stevens Institute of Technology
University of California
University of Cincinnati
University of Illinois
University of Kentucky
University of Michigan
University of Minnesota
University of Notre Dame
University of Pennsylvania
University of Pittsburgh
University of Wisconsin
Worcester Polytechnic Institute
Virginia Polytechnic Institute
Yale University

S.N.T. LUNCHEON and HONOR SESSION
12:00 noon—Wednesday, Nov. 4
Hotel Hamilton

RENSSELAER POLYTECHNIC INSTITUTE
4:00-7:00 p.m.—Wednesday, Nov. 5
Hotel Sherman

ALPHA SIGMA MU MEETING
9:00 a.m.—Thursday, Nov. 5
Hotel Sherman

A.S.M. ANNUAL DINNER
7:30 p.m.—Thursday, Nov. 5
Grand Ballroom, Hotel Sherman

A.S.M. DISTINGUISHED SERVICE LUNCHEON
12:00 noon—Friday, Nov. 6
Saddle and Sirloin Club, Stockyards
(25-Year Members and College Student Guests)

Tickets are on sale at the Registration Desks at the Hotel Sherman and at the International Amphitheater

LADIES PROGRAM

HEADQUARTERS
Sherman Hotel—Parlor "O"—Mezzanine

HOURS
Sunday 3:00 to 5:00 p.m.
Monday to Friday 9:00 a.m. to 5:00 p.m.
(Other hours ... call Mrs. Carl H. Samans, at the Sherman Hotel)

All ladies are asked to register immediately upon arrival so that scheduled events may be planned. *Reservations Are Necessary.* Registration Fee. $1.00.

Sunday, Nov. 1
3:00 to 5:00 p.m.
Registration at Headquarters

Monday, Nov. 2
9:00 to 11:00 a.m.
Registration and Coffee Hour at Headquarters

1:00 p.m.
Luncheon. Discussion of the "St. Lawrence Seaway", by William S. Bishop. Crystal Room, first floor, Sherman Hotel. Compliments of A.S.M.

Tuesday, Nov. 3
9:00 to 11:00 a.m.
Registration and Coffee Hour at Headquarters

10:45 a.m.
Buses leave LaSalle St. Entrance, Sherman Hotel

1:00 p.m.
Luncheon in the Four Seasons Room at the Stockyard Inn. $4.50. William Friedkin, producer-director from WTTW, Channel 11, will give a two-year resume of the Chicago area educational channel. Ladies may then proceed to the International Amphitheater, adjoining the Inn, to see the Metal Show.

Return to the Sherman Hotel via shuttle buses at your own leisure. Shuttles run about every 10 minutes.

Wednesday, Nov. 4
9:00 to 11:00 a.m.
Registration and Coffee Hour at Headquarters

10:30 a.m.
Conducted Tour Through the Art Institute of Chicago, Michigan at Adams

12:00 noon
Luncheon at the Club Room, Art Institute ... $4.00. Table decorations will be from the Art Institute Shop and may be purchased

Thursday, Nov. 5
9:00 to 11:00 a.m.
Breakfast at the Top-of-the-Rock, Prudential Bldg. ... $3.50.

1:00 p.m.
Tour of Patricia Stevens Modeling Agency and a "Self-Analysis" (Free)
(Following breakfast, Mrs. H. B. Knowlton will conduct a tour of "Old Orchard Shopping Center", Chicago's finest, if five or more sign up)

Friday, Nov. 6
8:00 to 10:00 a.m.
Coffee Hour at Headquarters

Chairman: Mrs. Carl H. Samans
Co-Chairman: Mrs. Carl E. Swartz

Chairmen for the Day		Hostess in Charge for Day
Mrs. A. R. Putnam	Sun.	Day Chairman
Mrs. C. H. Samans	Mon.	Chairmen and Hostesses
Mrs. M. Schell	Tues.	Mrs. R. Hobbein
Mrs. C. E. Swartz	Wed.	Mrs. L. Zadra
Mrs. H. B. Knowlton	Thurs.	Mrs. N. K. Koebel

Hostesses

Chicago	Calumet
Mrs. W. Wilson	Mrs. E. Dudley
Mrs. J. Greenberg	Mrs. L. Armstrong
Mrs. J. Hannan	Mrs. H. Housman
Mrs. R. Marshall	Mrs A. Grot
Mrs. P. Gordon	Mrs. J. McCune

Chicago-Western
Mrs. O. S. Spark
Mrs. L. G. Rowells
Mrs. W. O. Kaarlela

A.S.M. SEMINAR ON RESONANCE AND RELAXATION IN METALS

(All Sessions in the Grand Ballroom, Hotel Sherman)

SATURDAY, Oct. 31, 9:00 a.m.

Chairman: John N. Hobstetter

Acoustic and Magnetic Resonance, by Arthur S. Nowick, IBM Research Center

Cyclotron Resonance in Metals, by John K. Galt, Bell Telephone Laboratories

Nuclear Resonance in Metals at Low Fields, by Alfred G. Redfield, IBM Watson Laboratory

SATURDAY, Oct. 31, 2:00 p.m.

Chairman: R. I. Jaffee

Ferromagnetic Resonance, by Donald S. Rodbell, General Electric Research Laboratory

Relation of Metallic Bonding to Elastic Constants, by C. S. Smith, Case Institute of Technology

SATURDAY, Oct. 31, 8:00 p.m.

Chairman: Morris E. Fine

Dislocation Relaxation at High Frequencies, by P. G. Bordoni, University of Pisa, Italy

SUNDAY, Nov. 1, 9:00 a.m.

Chairman: Morris Nicholson

Elastic Internal Friction Effects in Crystals and Dislocations, by James S. Koehler, University of Illinois

Large Amplitude Effects and Fatigue, by W. P. Mason, Bell Telephone Laboratories

Investigation of Radiation Damage Using Acoustics, by David K. Holmes, Oak Ridge National Laboratories

SUNDAY, Nov. 1, 2:00 p.m.

Chairman: Raymond L. Smith

Stress Induced Atom Motion, by Charles A. West, University of Illinois

Interaction of Conduction Electrons and Acoustic Waves, by Donald F. Gibbons, Bell Telephone Laboratories

Investigation of Metallurgical Phenomena Through Elastic Constants, by John M. Sivertsen, University of Minnesota

TECHNICAL PROGRAM

NATIONAL METAL CONGRESS AND EXPOSITION

Chicago, Nov. 2-6, 1959

(All Sessions in Designated Rooms at the Sherman Hotel)

MONDAY, Nov. 2, 9:00 a.m.

Louis XVI Room

STEEL I

Presiding Officers

G. H. Enzian, Jones & Laughlin Steel Corp.
W. T. Lankford, U. S. Steel Corp.

Effect of Cold Work on Temper Brittleness, by A. S. Keh and W. C. Porr, U. S. Steel Corp., Research Center, Monroeville, Pa.

Influence of Static Stress and Temperature on Internal Damping, by J. W. Clark and W. C. Hagel, General Electric Co., West Lynn, Mass.

Correlation Between Internal Friction and Temper Brittleness in Steel, by A. F. K. Kaddou and P. C. Rosenthal, University of Wisconsin, Madison

Gas-Metal Reactions During Box Annealing of Low-Carbon Steel, by R. M. Hudson and G. L. Stragand, U. S. Steel Corp., Research Laboratory, Monroeville, Pa.

Importance of Directionality in Drawing Quality Sheet Steel, by R. L. Whiteley, Bethlehem Steel Co., Bethlehem, Pa.

MONDAY, Nov. 2, 9:00 a.m.

Assembly Room

TITANIUM

Presiding Officers

P. D. Frost, Battelle Memorial Institute
H. Margolin, New York University

Anomalous Effect of Hydrogen on the Mechanical Properties of Ti-8 Mn Alloy, by A. H. Fleitman, Crane Co., Engineering Div., Chicago, Ill.

Supersaturation as a Factor in the Hydrogen Embrittlement of Titanium Alloys, by D. N. Williams, F. R. Schwartzberg and R. I. Jaffee, Battelle Memorial Institute, Columbus, Ohio

Diffusion of Oxygen in Alpha and Beta Titanium, by W. P. Roe, American Smelting & Refining Research Laboratories, South Plainfield, N. J., H. R. Palmer, Titanium Metals Corp. of America, Henderson, Nev., and W. R. Opie, National Lead Co., Research Laboratory, South Amboy, N. J.

Kinetics of Decomposition of Alpha Prime in a Titanium-Copper Alloy, by M. P. Gomez, Boeing Airplane Co., Renton, Wash., and D. H. Polonis, University of Washington, Seattle

On the Aging Behavior of the Alloy Ti-6Al-4V, by J. M. Dupouy, M. B. Bever and B. L. Averbach, Dept. of Metallurgy, Massachusetts Institute of Technology, Cambridge

Corrosion Behavior of Titanium-Palladium Alloy, by M. Stern and C. R. Bishop, Metals Research Laboratories, Union Carbide Metals Co., Niagara Falls, N. Y.

MONDAY, Nov. 2, 2:00 p.m.

Louis XVI Room

HIGH-STRENGTH STEELS

Presiding Officers

D. G. Ebeling, General Electric Co.
O. O. Miller, International Nickel Co.

Fatigue Properties of High-Strength Steels, by H. E. Frankel and J. A. Bennett, National Bureau of Standards, Washington, D. C., and W. A. Pennington, University of Maryland, College Park

Influence of Pre-Existing Sharp Cracks on Brittle Fracture of a Ni-Mo-V Forging Steel, by E. T. Wessel, Westinghouse Electric Corp., Research Laboratories, Pittsburgh, Pa.

Dimensional Stability of a Precision Ball Bearing Material, by E. B. Mikus, Convair Astronautics, San Diego, Calif., and J. M. Gerty, T. J. Hughel and A. C. Knudsen, General Motors Technical Center, Warren, Mich.

Effect of Deformation Prior to Transformation on the Mechanical Properties of 4340 Steel, by E. B. Kula and J. M. Dhosi, Watertown Arsenal, Watertown, Mass.

Strength of Martensite Formed From Cold Worked Austenite, by J. C. Shyne, V. F. Zackay and D. J. Schmatz, Ford Motor Co., Scientific Laboratory, Dearborn, Mich.

TUESDAY, Nov. 3, 9:00 a.m.
Louis XVI Room

STEEL II

Presiding Officers

M. Cohen, Massachusetts Institute of Technology
S. L. Gertsman, Dept. of Mines & Technical Surveys, Canada

Effect of Austenitizing, Tempering and Microstructure on the Properties of a Cr-Mo-V Steel, by F. E. Werner, T. W. Eichelberger and E. K. Hann, Westinghouse Electric Corp., Research Laboratories, Pittsburgh, Pa.

Effect of Cooling Rate From Ms Temperature to Room Temperature on Magnetic Properties of 3.5% Chromium Magnet Steel, by W. L. Hodapp, Crucible Steel Co., Sanderson-Halcomb Works, Syracuse, N. Y., and E. A. Loria, Climax Molybdenum Co. of Pennsylvania, Pittsburgh

Tensile Properties of Copper-Bearing Low-Carbon Steel, by G. W. Bush, Pennsylvania State University, and R. W. Lindsay, Crucible Steel Co., Central Research Laboratory, Pittsburgh, Pa.

Retained Austenite in Precipitation Hardening Stainless Steels, by G. Krauss, Jr., and B. L. Averbach, Dept. of Metallurgy, Massachusetts Institute of Technology, Cambridge

TUESDAY, Nov. 3, 9:00 a.m.
Assembly Room

CREEP AND DEFORMATION

Presiding Officers

D. Krashes, Worcester Polytechnic Institute
K. M. Carlsen, Jones & Laughlin Steel Corp.

Effect of Stress on the Creep of Aluminum in the Dislocation Climb Range, by A. Bayce, W. D. Ludemann, L. A. Shepard and J. E. Dorn, Institute of Engineering Research, University of California, Berkeley

Experimental Survey of the Deformation of the Hard Ductile Two-Phase Alloy System WC-Co, by C. Nishimatsu and J. Gurland, Engineering Div., Brown University, Providence, R. I.

Directional Grain Structures for High-Temperature Strength, by F. L. VerSnyder and R. W. Guard, General Electric Co., Research Laboratory, Schenectady, N. Y.

Activation Energies for Creep of an Alpha Solid Solution of Magnesium in Aluminum, by N. R. Borch, L. A. Shepard and J. E. Dorn, Institute of Engineering Research, University of California, Berkeley

TUESDAY, Nov. 3, 2:00 p.m.
Louis XVI Room

PHYSICAL METALLURGY

Presiding Officers

R. A. Swalin, University of Minnesota
W. R. Upthegrove, University of Oklahoma

Study on the Relationship Between State of Aging and Notch-Fatigue Performance of a High-Strength Aluminum Alloy, by G. W. Form, Dept. of Metallurgical Engineering, Case Institute of Technology, Cleveland, Ohio

Precipitation Process in Copper-Chromium Alloys, by R. O. Williams, Cincinnati Milling Machine Co., Cincinnati, Ohio

Effect of Trace Elements on the Tensile, Electrical Resistance and Recrystallization Properties of High-Purity Nickel, by K. M. Olsen, Bell Telephone Laboratories, Inc., Murray Hill, N. J.

Thermal and Electrical Conductivities of Ductile Cast Iron and Several Gray Cast Irons, by J. H. Brophy, Massachusetts Institute of Technology, Cambridge, and M. J. Sinnott, University of Michigan, Ann Arbor

Investigation of Aluminum-Copper Composites Prepared by Solid-State Bonding, by J. M. Willams, Aircraft Nuclear Propulsion Dept., General Electric Co., Cincinnati, Ohio, and M. B. Bever, Massachusetts Institute of Technology, Cambridge

Substructure Characteristics of Fine-Grained Metals and Alloys Disclosed by X-Ray Reflection Microscopy and Diffraction Analysis, by S. Weissmann, Rutgers University, Bureau of Engineering Research, New Brunswick, N. J.

WEDNESDAY, Nov. 4, 2:00 p.m.
Louis XVI Room

MECHANICAL WORKING

Presiding Officers

J. F. Libsch, Lehigh University
E. M. Mahla, E. I. du Pont de Nemours & Co.

Effect of Rolling Variables on the Hot Rolling of Titanium and Titanium Alloys, by F. R. Larson and J. Nunes, Ordnance Corps, Watertown Arsenal, Watertown, Mass.

Effect of Initial Increments of Hot Working on the Mechanical Properties of Certain Ferrous Materials, by H. J. Wagner, Battelle Memorial Institute, Columbus, Ohio, and J. W. Spretnak, Dept. of Metallurgical Engineering, Ohio State University, Columbus

Thermo-Mechanical Method for Relieving Residual Quenching Stresses in Aluminum Alloys, by H. N. Hill, R. S. Barker and L. A. Willey, Engineering Design Div., Alcoa Research Laboratories, New Kensington, Pa.

Calculation of Rolling Forces Using the Orowan Theory, by J. E. Hockett, Los Alamos Scientific Laboratory, Los Alamos, N. Mex.

Effect of Selenium on the Machinability and Tensile Properties of 5% Chromium Steel, by F. W. Boulger, Div. of Ferrous Metallurgy, Battelle Memorial Institute, Columbus, Ohio

THURSDAY, Nov. 5, 9:00 a.m.
Louis XVI Room

NUCLEAR METALS

Presiding Officers

W. W. Martin, Los Alamos Laboratory
E. C. Miller, Oak Ridge National Laboratory

High-Strength Zirconium Alloys, by R. K. Wagner and H. E. Kline, Atomics International, Canoga Park, Calif.

Effect of Uranium Hydride Distribution and Recrystallization on the Tensile Properties of Uranium, by H. R. Gardner and J. W. Riches, General Electric Co., Richland, Wash.

Textures in Extruded Uranium, by R. B. Russell, Nuclear Metals, Inc., Cambridge, Mass.

Transformation Kinetics and Mechanical Properties of Uranium-0.5% Columbium-0.5% Molybdenum Alloys, by E. G. Zukas, Los Alamos Scientific Laboratory, Los Alamos, N. Mex.

Metallographic Study of Stringers in Inert Atmosphere-Melted Zircaloy-2, by J. D. Grozier, L. S. Rubenstein and J. G. Goodwin, Core Engineering Dept., Westinghouse Electric Corp., Bettis Plant, Pittsburgh, Pa.

THURSDAY, Nov. 5, 9:00 a.m.
Assembly Room

AUSTENITIC ALLOYS

Presiding Officers

W. O. Harms, University of Tennessee
S. W. Poole, Republic Steel Corp.

Some Metallurgical Factors Affecting Stress Corrosion Cracking of Austenitic Stainless Steels, by H. H. Uhlig,

Dept. of Metallurgy, Massachusetts Institute of Technology, Cambridge, and R. A. White, Standard Oil Co. of California, San Francisco

Tensile and Yield Strength of Cr-Mn-N Steels at Low Temperatures, by J. C. Shyne, F. W. Schaller and V. F. Zackay, Ford Motor Co., Scientific Laboratory, Dearborn, Mich.

Effect of Interstitial Carbon Plus Nitrogen and Precipitation Reactions on the Properties of Austenitic Cr-Mn-C-N Steels, by C. M. Hsiao, Peking Institute of Iron and Steel, China, and E. J. Dulis, Crucible Steel Co. of America, Central Research Laboratory, Pittsburgh, Pa.

Role of Boron in Cast Austenitic Alloys, by R. W. Kraft, Jr., United Aircraft Corp., East Hartford, Conn., and R. A. Flinn, Dept. of Chemical and Metallurgical Engineering, University of Michigan, Ann Arbor

Structure and Properties of Austenitic Alloys Containing Aluminum and Silicon, by D. J. Schmatz, Ford Motor Co., Scientific Laboratory, Dearborn, Mich.

Development of a Ferromagnetic Cobalt-Base High-Temperature Alloy, by A. Cochardt, Westinghouse Electric Corp., Research Laboratories, Pittsburgh, Pa.

A.S.M. METALS ENGINEERING PANEL CONFERENCE ON COMPOSITE METALS (All Sessions in the G. Bernard Shaw Room, Hotel Sherman)

MONDAY, Nov. 2, 9:00 a.m.

Precision and Specialty Composite Metals, by J. J. Buchinski, Metals and Controls Div., Texas Instruments, Inc.

Vacuum Coated Composites, by Howard M. Farrow, NBC Equipment Corp., and Philip J. Clough, National Research Corp.

Clad Metals, by Louis K. Keay, Lukens Steel Co.

MONDAY, Nov. 2, 2:00 p.m.

Laminated Metal and Ceramic Composite Materials, by F. R. Shanley, University of California, Los Angeles

Fiber Reinforced Metallic Composites, by Robert W. Jech, National Aeronautics and Space Agency

Metal Reinforced Ceramics, by Joseph W. Chambers, Marquardt Aircraft Co.

Vinyl-Coated Metals, by Edward B. Osborne, B. F. Goodrich Chemical Co.

A.S.M. METALS ENGINEERING PANEL CONFERENCE ON REFRACTORY METALS (All Sessions in the G. Bernard Shaw Room, Hotel Sherman)

WEDNESDAY, Nov. 4, 2:00 p.m.

Beryllium, by N. W. Bass, Brush Beryllium Co.

Vanadium, by T. W. Merrill, Vanadium Corp. of America

Columbium, by Ralph H. Hiltz, Tapco Group, Thompson Ramo Wooldridge, Inc.

THURSDAY, Nov. 5, 2:00 p.m.
Louis XVI Room

REFRACTORY METALS

Presiding Officers
H. H. Chiswik, Argonne National Laboratory
C. T. Sims, Knolls Atomic Power Laboratory

Properties of Refractory Alloys Containing Rhenium, by C. T. Sims, Knolls Atomic Power Laboratory, General Electric Co., Schenectady, N. Y., and R. I. Jaffee, Battelle Memorial Institute, Columbus, Ohio

Flow, Fracture and Twinning of Commercially Pure Vanadium, by W. R. Clough, Connecticut Operations—Canel, Pratt & Whitney Aircraft, Middletown, Conn., and A. S. Pavlovic, Union Carbide Metals Co., Niagara Falls, N. Y.

Exploration of High-Boron Alloys, by A. U. Seybolt, General Electric Co., Research Laboratory, Schenectady, N. Y.

Columbium-Oxygen System, by R. P. Elliott, Armour Research Foundation of Illinois Institute of Technology, Chicago

High-Temperature Oxidation of Tungsten-Columbium Alloys, by J. W. Semmel, General Electric Co., Flight Propulsion Laboratory Dept., Cincinnati, Ohio

A.S.M. METALS ENGINEERING PANEL CONFERENCE ON EXPLOSIVE FORMING (All Sessions in the G. Bernard Shaw Room, Hotel Sherman)

TUESDAY, Nov. 3, 9:00 a.m.

Principles and Future of Explosive Forming, by C. P. Williams, E. I. du Pont de Nemours & Co.

Adapting Explosive Forming to Production, by John J. Kelly, Stanford Research Institute

Dies, Explosives and Energy Transmittal, by C. O. Williams, Olin Mathieson Chemical Corp.

TUESDAY, Nov. 3, 2:00 p.m.

Applicability and Range of Applications of the Process:
Panelists—Floyd Cox, Ryan Aeronautical Co.
Joseph L. Bird, Nitroform, Inc.
C. P. Williams, E. I. du Pont De Nemours & Co.
John Rinehart, Colorado School of Mines
John Pearson, China Lake, Naval Ordnance Test Station

METAL POWDER INDUSTRIES FEDERATION AND POWDER METALLURGY PARTS MANUFACTURERS ASSOCIATION (Jointly With American Society for Metals) Old Chicago Room (101) Hotel Sherman

WEDNESDAY, Nov. 4, 2:00 p.m.

Powder Metallurgy Clinic—Advantages, Invitations, Applications:
Case Histories of Parts
Principles of Powder Metallurgy (Movie)
Panel Discussion

ULTRASONIC MANUFACTURERS ASSOCIATION (Jointly With American Society for Metals)
Grand Ballroom, Hotel Sherman

THURSDAY, Nov. 5, 2:00 p.m.

Ultrasonic Cleaning, by H. F. Osterman, Branson Ultrasonic Corp., and Stanley E. Rich, The General Ultrasonics Co.

Ultrasonic Processing, by Paul M. Platzman, The Narda Ultrasonics Corp., and Thomas J. Bulat, Pioneer-Central Div., Bendix Aviation Corp.

Ultrasonic Drilling, Machining and Grinding, by Harvey B. Foulkes, Jr., Cavitron Equipment Corp., and Paul A. Sorensen, Raytheon Manufacturing Co.

Ultrasonic Welding, Soldering and Brazing, by William C. Potthoff, Aeroprojects, Inc.

METAL TREATING INSTITUTE (Jointly With American Society for Metals)
Assembly Room, Hotel Sherman

THURSDAY, Nov. 5, 9:00 a.m.

HEAT TREATING TO RIGID SPECIFICATIONS

Carbon Control During Heat Treatment, by Frank Hobbs, Ipsenlab of Canada Ltd.

How to Obtain Specified Requirements Through Heat Treating, by L. J. Haga, State Heat Treat, Inc.

Heat Treatment of Gears:

Panelists—N. O. Kates—Furnace and Induction
J. Howat—Flame
H. C. Knerr—Nitriding
M. Soviak—Salt Bath

A.S.M.-A.E.C. SYMPOSIUM ON THE RARE EARTHS AND RELATED METALS
Bal Tabarin Room, Hotel Sherman

MONDAY, Nov. 2, 9:00 a.m.

OCCURRENCE AND EXTRACTION

General Introduction, by R. R. Nash, Div. of Research, Atomic Energy Commission

Historical Introduction, by F. H. Spedding, Iowa State University

Chemistry of the Rare Earths, by Therald Moeller, Unisity of Illinois

Occurrence and Strategic Supply, by R. J. Anderson, Battelle Memorial Institute

Separation by Fractional Crystallization, by Howard E. Kremers, Lindsay Chemical Div., American Potash and Chemical Co.

Separation by Liquid-Liquid Extraction, by D. F. Peppard, Argonne National Laboratory

Separation by Ion Exchange, by J. E. Powell, Iowa State University

MONDAY, Nov. 2, 2:00 p.m.

APPLICATIONS OF METALS AND COMPOUNDS

Non-Nuclear Applications to Magnesium, by T. E. Leontis, Dow Chemical Co.

Non-Nuclear Applications to Ferrous and Other Light Metals, by John F. Collins, V. P. Calkins and J. A. McGurity, General Electric Aircraft Nuclear Propulsion Dept.

Non-Nuclear Applications to Non-Metallic Items, by Howard E. Kremers, Lindsay Chemical Div., American Potash and Chemical Co.

Nuclear Applications, by Kermit Anderson, Knolls Atomic Power Laboratory

Analytical Chemistry of the Rare Earths, by C. V. Banks, Ames Laboratory, Iowa State University

Analytical Spectroscopy of the Rare Earths, by V. A. Fassel, Ames Laboratory, Iowa State University

TUESDAY, Nov. 3, 9:00 a.m.

PREPARATION OF RARE EARTH METALS

Metal Production From Fluorides, by O. N. Carlson and F. Schmidt, Ames Laboratory, Iowa State University

Metal Production From Chlorides, Bromides and Iodides, by F. E. Block, Albany (Ore.) Station, U. S. Bureau of Mines

Metallothermic Preparation of Rare Earth Metals, by A. H. Daane, Ames Laboratory, Iowa State University

Metallothermic Preparation of Yttrium, by O. N. Carlson, Ames Laboratory, Iowa State University

Electrolytic Preparation, by E. Morrice and R. G. Knickerbocker, Reno Station, U. S. Bureau of Mines

Refining and Purification of Rare Earth Metals, by C. L. Huffine and J. M. Williams, General Electric Co., Aircraft Nuclear Propulsion Dept.

Mechanical Fabrication of Rare Earth Metals, by Karl M. Bohlander, General Electric Co., Aircraft Nuclear Propulsion Dept.

TUESDAY, Nov. 3, 2:00 p.m.

PROPERTIES OF THE METALS AND THEIR ALLOYS

Physical Properties of the Rare Earth Metals, by A. H. Daane, Ames Laboratory, Iowa State University

Crystallography of the Rare Earth Metals, by K. A. Gschneidner, Los Alamos Scientific Laboratory

Metallography of the Rare Earth Metals, by B. Love, Research Chemicals Co.

Phase Diagrams, by C. E. Lundin, Denver Research Institute

Principles of Alloying Behavior, by J. T. Waber and K. A. Gschneidner, Los Alamos Scientific Laboratory

Mechanical Properties of Rare Earth Metals, by C. R. Simmons, General Electric Co., Aircraft Nuclear Propulsion Dept.

A.I.M.E. TECHNICAL PROGRAM
(All Sessions in Designated Rooms at Morrison Hotel)

MONDAY, Nov. 2, 9:00 a.m.
Ballroom

KINETICS OF PHASE TRANSFORMATIONS—I

Kinetics of Martensitic Transformations, by Larry Kaufman, Manufacturing Laboratories, Inc.
Kinetics of Ordering, by L. R. Weisberg, Radio Corp. of America
Kinetics of Precipitation, by David Turnbull, General Electric Co.

MONDAY, Nov. 2, 9:00 a.m.
Constitution Room

SYMPOSIUM ON REFRACTORY METALS—I

Electron Beam Melting of Refractory Metals, by Charles Hunt and H. R. Smith, Jr., Temescal Metallurgical Corp.
Shape Casting of Molybdenum, by E. D. Calvert, S. L. Ausmus and R. A. Beall, U. S. Bureau of Mines
Purification Reactions of Tantalum During Vacuum Sintering, by W. E. Klopp, D. J. Maykuth, H. B. Ogden and R. I. Jaffee, Battelle Memorial Institute
Consumable Arc Melting of Columbium-Base Alloys, by T. L. Robertshaw and D. L. Keller, General Electric Co.

MONDAY, Nov. 2, 9:00 a.m.
Cotillion Room

RESEARCH ABSTRACTS ON DIFFUSION

Self-Diffusion in Alpha Iron, by C. E. Birchenall and R. J. Borg, Princeton University
Diffusivity of Hydrogen in Alpha Iron, by D. C. Carmichael, Battelle Memorial Institute, J. R. Hornaday, Jr., General Motors Corp., A. E. Morris, U. S. Bureau of Mines and N. A. Parlee, Purdue University
Solubility and Diffusivity of Hydrogen in Iron, by M. L. Hill and E. W. Johnson, Westinghouse Electric Corp.
Thermal Diffusion of Carbon in Alpha and Gamma Iron, by Paul Shewmon, Carnegie Institute of Technology
Determinations of the Diffusion of Chromium by Autoradiographic Techniques, by H. W. Paxton, Tatsuro Kunitake and E. J. Pasierb, Carnegie Institute of Technology
Electron Microprobe Measurements of the Diffusion of Columbium, by L. S. Birks and R. E. Seebold, U. S. Naval Research Laboratory
Diffusion of Uranium and Aluminum-Silicon Eutectic Alloy, by D. R. Green, General Electric Co.
Prediction of Electric Mobilities in Molten Alloys, by E. E. Hucke, University of Michigan
Theory of Self-Diffusion in Liquid Metals, by R. A. Swalin, University of Minnesota
Solute Diffusion in Liquid Tin, by C. H. Ma and R. A. Swalin, University of Minnesota

MONDAY, Nov. 2, 9:00 a.m.
Embassy Room

RESEARCH ABSTRACTS ON METAL PROCESSING

Progressive Solidification Study for Vacuum Cold Hearth Melting, by J. H. Kelley, G. Facaros and B. W. Swanson, Westinghouse Electric Corp.
Directional Freezing of Magnesium Alloys, by A. S. Yue and J. B. Clark, Dow Chemical Co.
Effects of Arc-Melting Conditions on Reactor-Grade Zirconium Alloy Ingots, by J. H. Hart, Westinghouse Electric Corp.
Use of Vibration in the Solidification of High-Temperature Alloys, by L. M. Bianchi, J. H. Kelley and D. R. Carnahan, Westinghouse Electric Corp.
Effect of Ultrasonic Irradiation During Ingot Solidification, by W. A. Tiller, D. H. Lane and J. W. Cunningham, Westinghouse Electric Corp.
Melting Procedures as Related to Ingot Solidification, by D. R. Carnahan and L. M. Bianchi, Westinghouse Electric Corp.
Investigation of Metal Spinning, by S. Floreen, D. V. Ragone, E. E. Hucke and W. Steurer, University of Michigan
Determining the Drawing Quality of Sheet by the Hydraulic Bulge Tester, by W. N. Lambert, E. S. Madrzyk and F. E. Gibson, Inland Steel Co.
New Method for Compacting Metal Powders Into Continuous Sections, by Frank Emley and Charles Deibel, Westinghouse Electric Corp.

MONDAY, Nov. 2, 2:00 p.m.
Embassy Room

RESEARCH ABSTRACTS ON THERMODYNAMIC AND PHYSCIAL PROPERTIES OF METALS

Close-Packed Ordered Structures in Binary AB_3 Alloys of Transition Elements, by A. E. Dwight, Argonne National Laboratory, and P. A. Beck, University of Illinois
Crystal Structure of $MoNi_3$, by Shozo Saito and P. A. Beck, University of Illinois
Application of Gibbs-Duhem Equations to Multi-Component Systems, by N. A. Gokcen, University of Pennsylvania
Magnesium-Iron System, by A. S. Yue, Dow Chemical Co.
Uranium-Molybdenum Phase Diagram Below 900°, by A. E. Dwight, Argonne National Laboratory
Transformations in Uranium-Fissium Alloys, by S. T. Zegler and M. V. Nevitt, Argonne National Laboratory
Lattice Parameters of Zirconium-Oxygen Solid Solutions, by B. D. Lichter, U. S. Air Force
Lattice Expansion of Rhenium and Titanium, by J. I. Medoff and I. Cadoff, New York University
Propagation of Sound in Liquid Hg-Tl Alloys, by Gerald Abowitz and R. B. Gordon, Yale University
Influence of Lattice Defects on Superconductivity of Tantalum, by D. P. Seraphim, W. B. Ittner and D. T. Novick, International Business Machines Corp.
Superconductivity of Dilute Interstitial Alloys of Tantalum With Hydrogen, Nitrogen and Oxygen, by D. T. Novick, J. I. Budnick and D. P. Seraphim, International Business Machines Corp.

MONDAY, Nov. 2, 2:00 p.m.
Cotillion Room

RESEARCH ABSTRACTS ON CREEP AND FATIGUE

Effect of Stress on the Creep Rate of a Magnesium Crystal at 78 to 364° K., by Hans Conrad and L. Hays, Westinghouse Electric Corp.
Origin of Tertiary Creep in an Aluminum Alloy, by A. S. Nemy and F. N. Rhines, Thompson Ramo Wooldridge, Inc.
Effect of Dilute Copper Alloying on Creep of Aluminum Single Crystals, by D. Walton and L. Shepard, General Dynamics Corp., and J. E. Dorn, University of California
Creep of a Recrystallized Aluminum SAP-Type Alloy, by G. S. Ansell and F. V. Lenel, Rensselaer Polytechnic Institute
Static and Fatigue Strength of Metals Subjected to Tri-Axial Stresses, by William Lehrer and Harry Schwartzbart, Armour Research Foundation
Creep-Rupture of Alloys Near Their Melting Temperatures, by M. Korchynsky, Union Carbide Metals Co.

High-Temperature Fatigue in Air and Vacuum, by G. J. Danek, Jr., and M. R. Achter, U. S. Naval Research Laboratory

Crack Propagation in Air and Vacuum, by R. J. Sherman and M. R. Achter, U. S. Naval Research Laboratory

Damping and Fatigue Properties of High-Purity Aluminum, by L. J. Demer, University of Arizona

Metallographic Study of Fatigue in High-Purity Aluminum, by L. J. Demer, University of Arizona

MONDAY, Nov. 2, 2:00 p.m.

Constitution Room

SYMPOSIUM ON REFRACTORY METALS—II

Deformation of Zone-Melted Tungsten Single Crystals, by H. W. Schadler, General Electric Co.

Mechanical Properties of Tantalum Metal Consolidated by Melting, by M. Schussler, Union Carbide Metals Co., and J. S. Brunhouse, Aerojet-General Nucleonics

Columbium-Oxygen Reactions From 450 to 1200° C., by T. L. Kolski and W. T. Hicke, E. I. du Pont de Nemours and Co.

Reaction of Pure Tantalum With Nitrogen, Oxygen and Air, by W. M. Albrecht, W. D. Klopp, B. G. Koehl and R. I. Jaffee, Battelle Memorial Institute

MONDAY, Nov. 2, 2:00 p.m.

Ballroom

RESEARCH ABSTRACTS ON THE KINETICS OF PHASE TRANSFORMATIONS—II

Variational Principle for the Description of Complex Metallurgical Transformations, by J. S. Kirkaldy, McMaster University

Further Studies of Zone Formation, by H. Herman, M. E. Fine and C. Chiou, Northwestern University

Aging Characteristics of Cu-Ti Alloys, by G. T. Murray and J. B. Freeman, Materials Research Corp.

Phase Transformations in Ni-Ti-Al Alloys, by R. F. Decker and J. R. Mihalisin, International Nickel Co., Inc.

Thermal Stability of Precipitation-Hardened and Dispersion-Hardened Nickel-Base Alloys, by D. H. Feisel and Alexander Cochard, Research Laboratories, Westinghouse Electric Corp.

Transformation Kinetics of Alpha, Beta and Gamma Plutonium, by R. D. Nelson, General Electric Corp.

Hardening by Internal Oxidation as a Function of Velocity of the Oxidation Boundary, by J. L. Meijering, Philips Research Laboratories

Growth Rate of Bainite, by G. R. Speich, U. S. Steel Corp., and Morris Cohen, Massachusetts Institute of Technology

Influence of Solution Annealing Treatment Upon Transformation Kinetics in Ti-Cr Alloys, by H. I. Aaronson, Ford Motor Co.

Effect of Stresses on the Ordering Transformation in Au-Cu Alloy, by G. C. Kuczynski and A. Freda, University of Notre Dame

Hall Coefficient Changes During Ordering of Cu_3Au, by A. R. Von Neida and R. G. Gordon, Yale University

TUESDAY, Nov. 3, 9:00 a.m.

Ballroom

MECHANICAL PROPERTIES OF NON-METALS—I

Mechanical Properties of Covalent Crystals, by J. N. Hobstetter, University of Pennsylvania

Mechanical Properties of Polymeric Materials, by T. G. Fox, Mellon Institute

Mechanical Properties of Ionic Crystals, by J. J. Gilman, General Electric Co.

TUESDAY, Nov. 3, 9:00 a.m.

Constitution Room

SYMPOSIUM: TITANIUM VERSUS STEEL—I

Introduction, by W. J. Harris, Jr., Materials Advisory Board, National Academy of Sciences

General Case for Titanium, by W. W. Minkler, Titanium Metals Corp.

General Case for Steel, by R. B. Gunia, U. S. Steel Corp.

Titanium in Airframes, by E. A. Simkovich, Republic Aviation Corp.

Steel in Airframes, by E. A. Green, Lockheed Aircraft Co.

Titanium in Jet Engines, by G. J. Wile, General Electric Co.

Steel in Jet Engines, by Ralph Patsfall, General Electric Co.

TUESDAY, Nov. 3, 9:00 a.m.

Cotillion Room

RECENT ADVANCES IN STEELMAKING—I

Program not definitely formulated at press time

TUESDAY, Nov. 3, 9:00 a.m.

Embassy Room

SYMPOSIUM ON REFRACTORY METALS—I

Tin Reduction of Molybdenite, by A. D. Abraham and Charles Kray, Oregon Metallurgical Corp., and H. G. Poole, Colorado School of Mines

Molybdenum by Direct Thermal Dissociation of MS_2, by W. G. Scholz, D. V. Doane and G. A. Timmons, Climax Molybdenum Co. of Michigan

Tantalum Metal by Selective Solution, by R. L. Baughman and D. F. Taylor, Fansteel Metallurgical Corp.

Production and Purification of High-Purity Hafnium, by D. S. Fairgrieve and J. W. Fortner, Wah Chang Corp.

TUESDAY, Nov. 3, 12 noon

Hollywood Room

POWDER METALLURGY SPECIAL LUNCHEON

TUESDAY, Nov. 3, 2:00 p.m.

Ballroom

RESEARCH ABSTRACTS ON PROPERTIES OF NON-METALS—II

Dislocation Multiplication in LiF Crystals, by W. G. Johnston and J. J. Gilman, General Electric Co.

Dislocations in Indented Mg_2O Crystals, by A. S. Keh, U. S. Steel Corp.

Dislocation Arrangements in NaCl Single Crystals, by C. L. Bauer and R. B. Gordon, Yale University

Embrittlement of NaCl by Surface Compounds, by W. Class, E. S. Machlin and G. T. Murray, Materials Research Corp.

Effect of Grain Size on Deformation of Polycrystalline AgCl, by R. D. Carnahan, T. L. Johnston, R. J. Stokes and C. H. Li, Minneapolis-Honeywell Regulator Co.

Kinetics of Sintering of NaCl in an Inert Gas, by J B. Moser and D. H. Whitmore, Northwestern University

Electrical Resistivity of Boron and Some Boron-Phosphorus Alloys, by E. S. Greiner, Bell Telephone Laboratories

Diffusion of Lead in Single Crystals of Lead Selenide, by Martin Seltzer and J. B. Wagner, Jr., Yale University

Diffusion of Lead in Single Crystals of Lead Sulphide, by George Simkovich and J. B. Wagner, Jr., Yale University

Stress-Strain Characteristics of Lithium Fluoride Single Crystals, by W. L. Phillips, Jr., E. I. du Pont de Nemours and Co., Inc.

TUESDAY, Nov. 3, 2:00 p.m.

Constitution Room

SYMPOSIUM: TITANIUM VERSUS STEEL—II

Titanium for Pressure Bottles, by A. Hurlich, General Dynamics Corp.

Steel for Pressure Bottles, by J. F. Baisch, Boeing Airplane Co.

Titanium for Solid Fuel Motor Cases, by H. Hanink, Wright Aeronautical Corp.

Steel for Solid Fuel Motor Cases, by D. K. Hanink, General Motors Corp.

Titanium for Marine and Chemical Plant, by G. R. Prescott, C. F. Braun and Co.

Other Materials for Marine and Chemical Plant, by F. W. Fink, Battelle Memorial Institute

TUESDAY, Nov. 3, 2:00 p.m.
Cotillion Room

RECENT ADVANCES IN STEELMAKING—II

Program not definitely formulated at press time

TUESDAY, Nov. 3, 2:00 p.m.
Embassy Room

REFINING OF PURE METALS

High-Purity Single Crystals of Indium Antimonide, by S. E. Miller and W. P. Allred, Battelle Memorial Institute

Zone Refining of Reactor Metals, by G. E. Spangler, M. Herman, J. L. Rutherford and R. L. Smith, Franklin Institute

Floating-Zone Refining of Heavy Metals Using Electron Beam, by W. P. Allred and R. C. Himes, Battelle Memorial Institute

TUESDAY, Nov. 3, 6:30 p.m.
Ballroom

A.I.M.E. COCKTAIL PARTY AND DINNER

WEDNESDAY, Nov. 4, 9:00 a.m.
Ballroom

SYMPOSIUM ON IRRADIATION OF FUEL AND FUEL ELEMENTS—I

Nature of Fission Damage, by J. A. Brinkman, Atomics International Div., North American Aviation, Inc.

Variables Affecting the In-Pile Behavior of Fuel Materials, by H. J. Levinstein and R. H. Fillnow, Bettis Atomic Power Div., Westinghouse Electric Corp.

Swelling and Fission Gas Agglomeration in Metal Fuels, by A. T. Churchman, Central Electricity Generating Board, London, England

Nature of Inert Gas Agglomeration and Swelling in Metals, by R. S. Barnes, Atomic Energy Research Establishment, Harwell, England

Operational Performance of Bonded and Unbonded Uranium Fuel Rods, by T. T. Claudson, G. T. Geering, J. W. Goffard and J. E. Minor, Hanford Atomic Products Operation, General Electric Co.

Irradiation Behavior of U-FS and U-Pu-FS Fast Reactor Fuels, by J. A. Horak and J. H. Kittel, Argonne National Laboratory

Irradiation Behavior of U-Cb and U-Cb-Zr Alloys, by R. H. Fillnow, F. E. Card, C. E. Thomas, S. B. McRickard and H. J. Levinstein, Bettis Atomic Power Div., Westinghouse Electric Corp.

Crystallographic Study of Radiation-Induced Recovery in Cold Worked Uranium, by D. Tardivon

WEDNESDAY, Nov. 4, 9:00 a.m.
Constitution Room

SURFACES AND QUANTITATIVE METALLOGRAPHY

Thermal Etching of Silicon Iron, by D. S. Hutton and W. C. Leslie, U. S. Steel Corp.

Theory of Lateral Facet Growth by Surface Diffusion, by W. W. Mullins, Westinghouse Electric Corp.

Relative Energies of Tilt-Type Sub-Boundaries in Aluminum, by K. T. Aust, General Electric Co.

Influence of Surface Intersections on Crystal Growth From the Melt, by W. A. Tiller and G. F. Bolling, Westinghouse Electric Corp.

Quantitative Metallography for Volume-Fraction Analysis, by J. E. Hilliard and J. W. Cahn, General Electric Co.

WEDNESDAY, Nov. 4, 9:00 a.m.
Cotillion Room

RESEARCH ABSTRACTS ON PRECIPITATION AND DISPERSION HARDENING

Evidence of an Ordered Metastable Phase in Au-Ni Alloys, by J. R. Cost and C. A. Wert, University of Illinois

Electrical Resistivity of Cu-Fe Alloys After Plastic Deformation, by Alvin Boltax, Nuclear Metals Inc.

Criteria for Yielding of Dispersion-Strengthened Alloys, by G. S. Ansell and F. V. Lenel, Rensselaer Polytechnic Institute

Dispersed Particle Hardening of Al-Cu Single Crystals, by D. Dew-Hughes, International Business Machines Corp., and W. D. Robertson, Yale University

Mechanism of Hardening in Aged Al-Cu Alloys, by D. Dew-Hughes, International Business Machines Corp., and W. R. Robertson, Yale University

Strengthening by Precipitates in Al-Cu Alloys, by J. G. Byrne, A. Kelly and M. E. Fine, Northwestern University

WEDNESDAY, Nov. 4, 9:00 a.m.
Embassy Room

RESEARCH ABSTRACTS ON TITANIUM—III

Effect of Hydrogen and Other Variables on Thermal Stability of Titanium High in Aluminum, by S. R. Seagle and Stanley Abkowitz, Mallory-Sharon Metals Co.

Stabilization of Certain Ti_2Ni-Type Phases by Oxygen, by M. V. Nevitt, Argonne National Laboratory

Ti-TiO-ZrO_2 System, by Michael Hoch, R. L. Dean and S. M. Wolosin, University of Cincinnati

Effect of Rare Earth Additions on the Transition Temperature and Lattice Parameter of Alpha Titanium, by C. G. Kirkpatrick, Bernard Love and Virgil Novy, North American Aviation, Inc.

Mold Material for Titanium Castings, by A. R. C. Westwood, RIAS

Vacuum Arc Melting and Casting of Titanium, by B. W. Huber and E. J. Chapin, U. S. Naval Research Laboratory

WEDNESDAY, Nov. 4, 2:00 p.m.
Ballroom

SYMPOSIUM ON EFFECTS OF IRRADIATION ON FUEL AND FUEL ELEMENTS—II

Irradiation Behavior of UO_2 Fuel Elements, by J. A. L. Robertson, A. S. Bain, G. M. Allison and W. H. Stevens, Atomic Energy of Canada Ltd.

Swelling of UO_2 at High Burn-Up, by W. K. Barney, Knolls Atomic Power Laboratory, General Electric Co.

Irradiation Testing of Plutonium-Uranium Oxide Nuclear Fuel, by J. L. Bates and W. E. Roake, Hanford Atomic Products Operation, General Electric Co.

Effect of Radiation on Massive Uranium Carbide, by H. Pearlman, Atomics International Div., North American Aviation, Inc.

Irradiation Behavior of ThO_2-UO_2 Fuels, by L. A. Neimark and J. H. Kittel, Argonne National Laboratory

Release of Fission Products From Fueled Graphite, by W. C. Riley, D. N. Sunderman and B. W. Dunnington, Battelle Memorial Institute

WEDNESDAY, Nov. 4, 2:00 p.m.
Constitution Room

RESEARCH ABSTRACTS ON PLASTICITY AND STRENGTH OF SINGLE PHASES

Effect of Quenching on Mechanical Properties of Molybdenum, by W. Liebmann and Robert Maddin, University of Pennsylvania

Structure, Formation and Properties of Chromium Filaments, by S. T. Wlodek, W. W. Webb and W. D. Forgeng, Union Carbide Metals Co.

Tensile Deformation of Aluminum Single Crystals at Low Temperatures, by W. F. Hosford, Jr., R. L. Fleischer and W. A. Backofen, Massachusetts Institute of Technology

Mechanism of Deformation Leading to Tensile Fracture of Aluminum and Copper, by W. D. Sylwestrowicz, Bell Telephone Laboratories

Hedge Mechanism for Work Hardening, by U. F. Kocks, Harvard University

Strain Aging in Ag-Al Alloys, by A. A. Hendricksen and M. E. Fine, Northwestern University

Yield Point Phenomena in Commercial Copper Alloys and One Nickel-Base Alloy, by V. A. Phillips, General Electric Co., and R. B. Jones, Sheffield University, England

Solution Hardening by Interaction of Impurity Gradients and Dislocations, by R. L. Fleischer, Massachusetts Institute of Technology

Deformation Characteristics of Mo-Re Alloys, by Alan Lawley and Robert Maddin, University of Pennsylvania

WEDNESDAY, Nov. 4, 2:00 p.m.

Cotillion Room

RESEARCH ABSTRACTS ON REFRACTORY METALS—II

Fatigue and Tensile Properties of Columbium at Elevated Temperatures, by J. F. Enrietto, G. M. Sinclair and C. A. Wert, University of Illinois

Alloy Strengthening of Columbium, by W. F. Sheely, Union Carbide Metals Co.

Strengths of Some Columbium-Base Alloys, by W. H. Chang, General Electric Co.

Effect of Prestrain and Polygonization on Creep of Molybdenum, by A. Iannucci, J. Intrater and Sheldon Weinig, Materials Research Corp.

Refractory Metal Thermocouples, by J. C. Lachman, Aircraft Nuclear Propulsion Dept., General Electric Co.

Elevated Temperature Strength of Tungsten, by G. H. Keith and E. F. Vandergrift, Westinghouse Electric Corp.

Physical and Mechanical State of Compacted Tungsten Powders as a Function of Pressing Rate, Particle Size Distribution and Impurities, by H. G. Sell, Westinghouse Electric Corp.

Mechanical Properties of Tungsten Wire, by A. J. Opinsky, Sylvania Electric Products, Inc.

Mechanical Properties of Tungsten, by E. L. Harmon, Union Carbide Metals Co.

Properties of Slip-Cast Tungsten, by G. Reinhardt and F. R. Charvat, Union Carbide Metals Co.

Determination of Latent Heats of Impurities Which Undergo Phase Transformations When Tungsten Powder Compacts Are Sintered, by H. G. Sell, Westinghouse Electric Corp.

WEDNESDAY, Nov. 4, 2:00 p.m.

Embassy Room

RESEARCH ABSTRACTS ON OXIDATION AND REDUCTION

Thermodynamic Properties of Titanium-Oxygen, Zirconium-Oxygen and Hafnium-Oxygen Alloys, by K. L. Komarek, New York University

Oxidation of Iron in CO-CO_2 Atmospheres, by W. M. Smeltzer, McMaster University

Mechanism of Oxidation of Iron in CO-CO_2 Mixtures, by Frederick Pettit, Robert Yinger and J. B. Wagner, Jr., Yale University

Oxidation of Ni-Rich Cu-Ni Alloys, by J. A. Sartell and C. H. Li, Minneapolis-Honeywell Regulator Co.

Oxidation Characteristics of Columbium Alloys Containing W, Mo, Ti and Al, by W. H. Chang, General Electric Co.

Dispersed Phase Alloys of Aluminum and of Silver, by H. R. Peiffer, RIAS

Equilibrium Study of Magnesium Reduction of Uranium Dioxide in Bismuth Matrix, by R. E. Balzhiser, E. E. Hucke and D. V. Ragone, University of Michigan

Effect of Arsenic on the Reduction of Tungstic Oxide, by J. M. Laferty, Jr., Sylvania Electric Products, Inc.

Effect of Impurities on the Reduction of Tungstic Oxide, by P. C. Fisher, Jr., and J. M. Laferty, Jr., Sylvania Electric Products, Inc.

THURSDAY, Nov. 5, 9:00 a.m.

Ballroom

MELTING AND CASTING OF NONFERROUS METALS I—CURRENT PRACTICES

Melting and Casting of Zinc at Trail, B.C., by J. M. Buchanan, Consolidated Mining and Smelting Co. of Canada, Ltd.

Current Practices in the Melting and Casting of Copper Alloys, by P. H. Kirby, American Brass Co.

Melting and Casting Nickel Alloys, by C. G. Bieber, International Nickel Co.

Gas and Its Control in the Casting of Aluminum, by Donald La Velle, American Smelting and Refining Co.

Factors Affecting the Structure of Continuously Cast Slabs of Aluminum, by Dieter Altenpohl, Aluminum Foils, Inc.

THURSDAY, Nov. 5, 9:00 a.m.

Constitution Room

RESEARCH ABSTRACTS ON RECOVERY, GRAIN GROWTH AND TEXTURES—I

Recovery of the Extra-Resistivity of Cold Worked Cadmium From 100 to 273° K., by H. R. Peiffer and F. R. Stevenson, RIAS

Effect of Cold Rolling Procedure on Recrystallization of Iron, by J. T. Michalak, U. S. Steel Corp., and W. R. Hibbard, Jr., General Electric Co.

Preferred Orientation Resulting From Simple Shear, by R. O. Williams, Cincinnati Milling Machine Co.

Kinetics of the Energy Release From Deformed Metals and Alloys, by R. O. Williams, Cincinnati Milling Machine Co.

Polygonization of 31% Alpha-Brass, by V. Y. Doo, International Business Machines Corp.

Subgrain Growth and Softening in Rolled Aluminum Crystals, by B. G. Ricketts, University of Illinois, A. Kelly, Cambridge University, and P. A. Beck, University of Illinois

Recrystallization of Cold Drawn, Sintered Aluminum Powder, by E. J. Westerman, General Electric Co., and F. V. Lenel, Rensselaer Polytechnic Institute

Effect of Impurities on the Recrystallization of Tantalum, by M. A. Cocca, General Electric Co.

Migration of Grain Boundaries in Zone-Refined Lead Containing Very Dilute Additions of Ag and Au, by K. T. Aust and J. W. Rutter, General Electric Co.

Swelling of Irradiated Alloy Fuels During Post Irradiation Annealing, by W. V. Johnston, General Electric Co.

THURSDAY, Nov. 5, 9:00 a.m.

Cotillion Room

RESEARCH ABSTRACTS ON IMPERFECTIONS

Dislocation Etch Pits and Plastic Deformation in Copper Single Crystals, by J. D. Livingston, General Electric Co.

Dislocation Networks in Zinc Crystals, by V. V. Damiano, Franklin Institute

Mobility of Edge Dislocations in Silicon-Iron Crystals, by D. F. Stein and J. R. Low, Jr., General Electric Co.

Individual Dislocations in Alpha Brass, by J. D. Meakin and H. G. F. Wilsdorf, Franklin Institute

Observation of Dislocations in Aluminum by X-Ray Extinction Contrast, by J. M. Lommel, General Electric Co.

Dislocations and Sub-Boundaries in Metal Crystals Grown From the Melt, by C. Elbaum, Brown University

X-Ray Measurement of Stacking Faults in Deformed Cu-Si Wires, by D. H. Felter and H. M. Otte, RIAS

Dislocations Formed by Vacancy Condensation, by G. Schoeck and W. A. Tiller, Westinghouse Electric Corp.

Contribution of Dislocation Line Tension and the Density of the Solute Atmosphere to the Yield Point in Strain-Aged Ingot Iron, by T. Mura and J. O. Brittain, Northwestern University

Effect of Orientation and Pre-Strain on the Delay Time of Aluminum Single Crystals, by I. R. Kramer, RIAS

THURSDAY, Nov. 5, 9:00 a.m.

Embassy Room

POWDER METALLURGY—I

Molecular Processes at the Gas-Metal Interface, by Gert Ehrlich, General Electric Co.

Effects of Oxide Films on the Sintering Behavior of Metal Powders, by H. H. Hausner, Consultant

Equilibrium Phenomena Between Gases and Solid Surfaces in Sintered Metals, by Michael Eudier, La Metallurgie Francaise des Poudres Metafram, France

THURSDAY, Nov. 5, 2.00 p.m.

Ballroom

RESEARCH SUMMARIES ON NONFERROUS MELTING AND CASTING—II

Vacuum Induction Melting of Mg-Li Alloys, by R. J. Jackson, T. G. Byrer and P. D. Frost, Battelle Memorial Institute

Effect of Production Variables on the Quality of Light Alloy Castings, by J. W. Meier, Dept. of Mines and Technical Surveys, Ottawa, Canada

Some Factors Influencing Grain Refinement in Nonferrous Alloys, by Walter Showak, Ford Motor Co.

A Cold Mold Induction Furnace for Melting Reactive Metals Without Contamination, by G. H. Schippereit and A. F. Leatherman, Battelle Memorial Institute, and D. Evers, Mallory-Sharon Metals Corp.

THURSDAY, Nov. 5, 2:00 p.m.

Constitution Room

RESEARCH ABSTRACTS ON RECOVERY, GRAIN GROWTH AND TEXTURES—II

Evolution of Deformation and Recrystallization Textures in Cu-Ge and Cu-Sn Alloys, by Y. C. Liu and R. H. Richman, Ford Motor Co.

Effect of Grain Growth on the Cube Texture in an Al-Mn Alloy, by T. J. Koppenaal, Northwestern University, and M. N. Parthasarathi and P. A. Beck, University of Illinois

A Texture Problem Involving Orientation Density, by C. G. Dunn and J. L. Walter, General Electric Co.

Secondary Recrystallization in Cube-Textured 50% Ni, 50% Fe Alloy Tapes, by N. I. Ananthanarayanan, R. H. Buckwalter and R. G. Aspden, Westinghouse Electric Corp.

Texture of Silicon Iron, by P. K. Koh, Allegheny Ludlum Steel Corp., and C. G. Dunn, General Electric Co.

Influence of Constraints During Rolling on the Textures of 3% Si Iron Crystals Initially (001) [100], by R. G. Aspden, Westinghouse Electric Corp.

Cube Growth in Silicon Iron, by G. W. Wiener, Westinghouse Electric Corp.

Initial Growth of Cube-Oriented Secondary Recrystallization Nuclei in High-Purity Silicon-Iron, by J. L. Walter and C. G. Dunn, General Electric Co.

Nature of the Matrix for Secondary Recrystallization to the Cube Texture in High-Purity Silicon-Iron, by C. G. Dunn and J. L. Walter, General Electric Co.

THURSDAY, Nov. 5, 2:00 p.m.

Cotillion Room

HEAT TREATMENT AND PROPERTIES OF STEELS

Anomalous Kinetics of the Bainitic Transformations Just Above the Ms Temperature, by M. F. Smith, Nuclear Metals, Inc., G. R. Speich, U. S. Steel Corp., and Morris Cohen, Massachusetts Institute of Technology

Effect of Pressure on the Martensitic Transformations in the Iron-Nickel System, by L. Kaufman, S. A. Kulin and H. Udin, Manufacturing Laboratories, Inc.

Effect of Heat Treatment in the Ferrite-Austenite Region on Notch Toughness of Low-Carbon Steels, by W. C. Leslie, R. L. Rickett and W. D. Lafferty, U. S. Steel Corp.

Preferred Orientation in Warm Worked and Heat Treated 4340 Steel, by E P. Kula and S. L. Lopata, Watertown Arsenal

Effect of Sulphur on the Notch Toughness of Heat Treated Steels, by J. M. Hodge, R. H. Frazier and F. W. Boulger, Battelle Memorial Institute

Magnetism in 0.30% C, 18% Cr, 8% Ni, 3% Si Valve Steel Alloys, by S. M. Purdy, Carpenter Steel Co.

Effect of Tensile and Creep Prestrain on a Precipitation Hardening, High-Temperature Alloy, by J. T. Brown, Westinghouse Electric Corp.

Measurement of Chi and Sigma Phases in Stainless Steel With the Electron Beam Microanalyzer, by L. S. Birks and J. Stomkajlo, U. S. Naval Research Laboratory, and P. K. Koh, Allegheny Ludlum Steel Corp.

Recrystallization of Austenite, by R. A. Grange, U. S. Steel Corp.

THURSDAY, Nov. 5, 2:00 p.m.

Embassy Room

POWDER METALLURGY—II

Infiltration of Alumina With Silver, by J. W. Proske and A. J. Shaler, Pennsylvania State University

Coulometric Reduction: A Tool for Studying Surface Films, by V. J. Albano, Bell Telephone Laboratories

Effects of Surface Parameters on Dimensional Changes in Iron-Copper Sinterings, by Morse Hill and H. P. Munger, Republic Steel Corp.

SOCIETY FOR NONDESTRUCTIVE TESTING TECHNICAL PROGRAM

(All Sessions at the Hotel Hamilton)

MONDAY, Nov. 2, 9:00 a.m.

NEW INSTRUMENTATION AND TECHNIQUES—I

Product Reliability Through Nondestructive Testing, by K. E. Cochran and H. T. Gruber, Battelle Memorial Institute

Radioactive Magnetic Particle Inspection, by Herbert E. Farmer, General Electric Co.

Automatic Processing in Industrial Radiography, by A. H. Allard and William D. Kiehle, Eastman Kodak Co.

Radiography With the Electron Linear Accelerator, by Samuel A. Wenk, Applied Radiation Corp.

Report on "ADC"—a New Technique for Improving Accuracy of Eddy Current Flaw Detectors, by Richard Hochschild, Metrol Inc.

Field Distribution During Prod Magnetization, by R. W. Gruetzmacher and Glen O. McClurg, Magnaflux Corp.

MONDAY, Nov. 2, 2:00 p.m.

NEW INSTRUMENTATION AND TECHNIQUES—II

Use of Beta X-Ray in Nondestructive Testing, by Warren J. McGonnagle, Argonne National Laboratory

Portable Spectrograph, by David C. Miller, Philips Electonics, Inc.

Radiography With Kilocurie Cobalt-60 Sources, by J. A. Reynolds and M. R. Rosumny, Picker X-Ray Corp.

Frequency Dependent Effects in Ultrasonic Resonance Testing, by Robert V. Harris and John E. Bobbin, Branson Instruments, Inc.

Utilization of Electrical Conductivity as a Nondestructive Tool, by Leonard M. Taussig, Taussig Associates

TUESDAY, Nov. 3, 9:00 a.m.

NONDESTRUCTIVE TESTING CORRELATED WITH FATIGUE TESTING—PANEL DISCUSSION

Establishing Acceptance Standards Through Rig Testing, by F. Nixon, Rolls-Royce Ltd., Derby, England

Analytical Approach to the Study of the Effect of Small Cavities on Fatigue Strength, by R. E. Peterson, Westinghouse Electric Corp., Research Laboratories
Panelists: H. N. Hill and I. D. Eaton, Aluminum Co. of America

TUESDAY, Nov. 3, 2:00 p.m.

COMPONENT RELIABILITY—I

Automatic Inspection of Jet Rotors, by H E. Van Valkenburg, Sperry Products, Inc.
Radiographic Inspection of Sealed Electronic Components, by Leslie T. Hahn, Convair
Nondestructive Testing of Large Solid Propellant, Case Bonded Rocket Motors, by J. H. Cusick, U. S. Naval Ammunition Depot, Concord, Calif.
Glueline Thickness Measurements by Eddy Current Inspection, by Leo L. Soffa, Northrop Corp.
Evaluation of Coating Thickness Testing Methods, by Clifford L. Gough, Perfect Circle Corp.
Propellant Inspection by High-Voltage Radiation, by D. Polansky, E. L. Criscuolo and J. A. Holloway, Naval Ordnance Laboratory

WEDNESDAY, Nov. 4, 9:00 a.m.

COMPONENT RELIABILITY—II

Automatic Cladding Thickness and Bonding Tester for Reactor Fuel Elements, by David O. Hunter, Hanford Atomic Products Operation
A Through Transmission System Using Pulsed Eddy Currents, by C. J. Renken, Argonne National Laboratory
Inductive Thermometry, by Hugo L. Libby, Hanford Atomic Products Operation
Automatic Particle Size Determination From Microradiographs, by William Distler and Valmore Reshenk, Lawrence Radiation Laboratory, and Gordon Miller, Sandia Corp.
Studies in Broadband Eddy Current Testing, by Hugo L. Libby, Hanford Atomic Products Operation

WEDNESDAY, Nov. 4, 12:00 noon

S.N.T. LUNCHEON

Address on Nondestructive Testing in Medicine, by Charles O. Bechtol, M.D.

WEDNESDAY, Nov. 4, 2:15 p.m.

S.N.T. ANNUAL MEETING AND HONOR SESSION
THE LESTER LECTURE

The Nondestructive Testing Engineer—Today's Career Opportunity, by Carl E. Betz, Magnaflux Corp.
Presentation of the DeForest and the Coolidge Awards
Annual Business Meeting

THURSDAY, Nov. 5, 9:00 a.m.

COMPONENT RELIABILITY—III

Radiographic Technique at 250 Kvp., by J. A. Holloway, D. Polansky and E. L. Criscuolo, U. S. Naval Ordnance Laboratory
Nondestructive Testing Techniques for Components of Critical Antifriction Bearings, by E. W. Garrison, Marlin Rockwell Corp.
Recent Advances in Ultrasonic Research and Development, by Herbert E. Elion, Elion Instruments, Inc.
Flaw Detection and Bond Testing With Ultrasonic Recorders, by R. E. Kleint and H. Mitchell, Ultrasonic Testing and Research Laboratory
Ultrasonic Inspection—Its Present and Future Status, by John W. Orner, Watertown Arsenal

THURSDAY, Nov. 5, 2:00 p.m.

PROBLEMS FACING THE AIRCRAFT INDUSTRY IN INSPECTION OF BRAZED HONEYCOMB STRUCTURES—PANEL DISCUSSION

Panelists: William C. Hitt, Douglas Aircraft Co. Inc.
H. Harris, North American Aviation Co.
Robert Booth, Boeing Airplane Co.
John D. Fenton, Convair
William Mays, North American Aviation Corp.
G. E. Molzahn, Lockheed Aircraft Corp.

FRIDAY, Nov. 6, 9:00 a.m.

EDUCATIONAL CLINIC—I

Scope of Present Nondestructive Testing Field, by D. W. Ballard, Sandia Corp.
Radiography, Including Isotope Radiography, by W. D. Kiehle, Eastman Kodak Co.
Darkroom Techniques, by S. S. Stacey, Ansco Corp.
Fluoroscopy, by W. Hampe, Westinghouse Electric Corp.
Magnetic Particle Inspection, by W. E. Thomas, Magnaflux Corp.

FRIDAY, Nov. 6, 1:30 p.m.

EDUCATIONAL CLINIC—II

Penetrant Inspection, by H. Migel, Magnaflux Corp.
Eddy Current Test Methods, by H. L. Libby, Hanford Atomic Products Operation
Ultrasonics: Theory and Instrumentation, by H. E. Van Valkenburg, Sperry Products
Ultrasonics: Applications and Interpretations, by W. C. Hitt, Douglas Aircraft Co.
Writing in Modern Technology, by R. Nelson, General Electric Co.

SPECIAL LIBRARIES ASSOCIATION
METALS DIVISION
(Headquarters at LaSalle Hotel)

THURSDAY, Nov. 5, 9:00 a.m.

VISIT TO THE INSTITUTE FOR THE STUDY OF METALS

(Open to Metals Division members only)

Informal Discussions of Research in
Solid State Physics, Theoretical Metallurgy, Temperatures Nearing 0° K., and Effects of Very High Pressures, by Earl Long, Cyril Stanley Smith, Andrew Lawson, Charles Barrett and Robert Gomer

THURSDAY, Nov. 5, 1:00 p.m.

VISIT TO ARGONNE NATIONAL LABORATORY

(Open to Metals Division members only)

Lunch in West Area Cafeteria
Tour of Physics Library
Orientation on Technical Information Division
Tour of Chemistry Library
Tour of "Hot" Laboratory
Tour of "CP-5 Research Reactor"

THURSDAY, Nov. 5, 6:00 p.m.
LaSalle Hotel

BANQUET WITH ILLINOIS CHAPTER S.L.A

FRIDAY, Nov. 6, 9:30 a.m.
LaSalle Hotel

SESSION ON STEELMAKING AND PRODUCT PACKAGING

Continuous Converting of Cupola Iron Into Steel by Oxygen Blow, by W. F. Hinkle, Acme Steel Co.
Latest Developments in Packaging Design, by J. H. Myers, Acme Steel Co.
Strapping Machines in the Packaging Field, by H. Connell, Acme Steel Co.

FRIDAY, Nov. 6, 12:45 p.m.

INSPECTION TRIP TO ACME STEEL CO.

(Open to Metals Division members only)

By Bus to Riverdale to Tour the Recently Installed Continuous Cupola, Oxygen Converter Process of Steelmaking

A.S.M. To Inaugurate Electronic Literature Searching Service in '60

A new literature searching service, the A.S.M. Metals Documentation Service, for A.S.M. members and the metallurgical profession, to be launched by the American Society for Metals early in 1960, has been approved by the Board of Trustees. The service will locate documents describing any aspect of metallurgical science and engineering and the fabrication and use of metal parts appearing in international literature.

Subscribers to the searching service will be provided with information in the form of article abstracts selected to answer the exact specifications of the inquiry.

According to Allan Ray Putnam, managing director A.S.M., the Metals Documentation Service is based on a five-year pilot experiment in the field of mechanized searching of metals literature which has been successfully concluded by the Society. The trial project, conducted at the Center for Documentation and Communication Research at Western Reserve University, was financed by a grant of $75,000 from the Society.

Start of the searching service awaits delivery by the General Electric Co. of the first in a new product line of electronic computer-type machines designed specifically for this purpose. The G. E. unit, known as the GE-250, will be delivered in February 1960.

Mock-Up to be at Metal Show

A mock-up of the new literature-searching machine will be displayed in the A.S.M. booth (810) at the National Metal Exposition, with staff members on duty to explain the contemplated service.

Directing A.S.M.'s experimental efforts has been Marjorie Hyslop, able, long-time employee of the Society, who currently, among other duties, is managing editor of *Metal Progress,* editor of the Society's 15-year-old *Review of Metal Literature,* and secretary of A.S.M.'s Advisory Committee on Mechanical Searching of Literature.

Mrs. Hyslop has spent a good part of the last 11 years doing advance work in the field of metals documentation. She is a member of a jointly formed committee of A.S.M. and the Special Libraries Association to review and develop metallurgical literature classifications.

A major in metallurgy at Ohio State University, Marjorie (Mrs. John A.) Hyslop has been with the A.S.M. since a summer job in 1927 resulted in a full-time connection after her graduation. As one of the first two employees on *Metal Progress,* she has had wide experience in the field of metal documents.

Subscribers Can Specify

Subscribers to the new searching service will have opportunity to specify exactly the limitations of the subject area desired. A.S.M. believes that the searching service will be beneficial to industrial metal working plants, research laboratories, libraries, engineering and scientific managements and governmental agencies which need to put their fingers on specific metals data.

"For long the A.S.M. has felt a need existed for a broad mechanized literature searching service in the metals field. We have truly been pioneers in the project and are happy that our expectations have been realized", said Clarence H. Lorig, A.S.M. president.

Present plans call for a procedure of searching world metallurgical literature every two weeks according to subscribers' interests. Abstracts will be sent to them promptly. As a "bonus offer" searches of the previous year's literature will be included in the first year's service to the subscriber, in an effort to assure that no timely treatment will be missed.

To Encode 12,000 Titles

A.S.M. has authorized the encoding by the new operation of all 12,000 documents to be abstracted in Review of Metal Literature during 1960, which will double the encoding rate of two years ago.

Approval by the National Science Foundation of a proposal to cover adjoining or overlapping fields of science for subscribers will enhance the new service considerably. It is expected that approval by the Foundation will be forthcoming.

Philadelphia Students Receive Scholarships

Robert Maddin, Professor of Metallurgy, University of Pennsylvania, Is Shown With Richard Dietsch, Recipient of a One-Year Scholarship to Drexel Institute, Presented During a Philadelphia Meeting

Melvin Brody, University of Pennsylvania Metallurgy Student, Is Shown During Presentation of an A.S.M. Scholarship at a Philadelphia Meeting With A. W. Grovsenor, Drexel Institute of Technology

Metallurgical News and Developments

A Department of *Metals Review*, published by the American Society for Metals Metals Park Novelty, Ohio

Devoted to News in the Metals Field of Special Interest to Students and Others

French Schedule Meeting—The annual meeting of the French Society of Metallurgy will be held in Paris, Oct. 19-24, 1959. The theme will be "Gases in Metals". For information write to: Max Dupont, Societe Francaise de Metallurgie, 25, rue de Clichy, Paris 9e France.

Steels for Nuclear Power Reactors—The first large-scale investigation of radiation effects on steels in a private test reactor completely financed by private industry has been started by General Electric Co. and U.S. Steel Corp. The corrosion resistance of a wide variety of steels, effects of high-intensity neutron irradiation on steels and an investigation of the mechanism of radiation damage will be covered in a program designed to develop steels for nuclear power reactors.

Forging Foundation—Plans for a Forging Industry Educational and Research Foundation, dedicated to the advancement of formal education and research in forging technology, were outlined at the Annual Meeting of the Drop Forging Association.

High-Purity Tungsten Carbide — Union Carbide Metals Co. announces a new process of making tungsten carbide powder which will enable cutting tool manufacturers to produce cemented, sintered or cast inserts with a minimum of processing. For information write to: Union Carbide Metals Co., New Products Engineering Div., P. O. Box 330, Niagara Falls, N. Y.

Vacuum Coating Process—National Research Corp. has developed a vacuum plating process which will deposit a tightly adherent, decorative and corrosion-resistant coating of pure aluminum on a wide range of base metals. Hydrogen embrittlement encountered in conventional electroplating of high-tensile steels is eliminated. Further information from: National Research Corp., 70 Memorial Drive, Cambridge, Mass.

New Adhesives—B. F. Goodrich Products Co. has developed two new adhesives for polystyrene foam, said to produce bonds so strong that the polystyrene will fail before the bonds will break. One of the adhesives has the advantage of having no noticeable "stress crazing" effect on the polystyrene, that is, collapsing the foam at the point of bonding.

Ferrochrome—The fastest dissolving low-carbon ferrochrome for stainless steel is now being produced by Union Carbide Metals Co., Division of Union Carbide Corp.

Testing Conference—The Third International Conference in Nondestructive Testing is to be held in Tokyo and Osaka, Japan, Mar. 15-21, 1960. For information write: The Secretary, Organizing Committee, Third International Conference on Nondestructive Testing, Science Council of Japan, Ueno Park, Taiti-ku, Tokyo.

Conference on Magnetism—The Fifth Conference on Magnetism and Magnetic Materials will be held in Detroit, Nov. 16-19, 1959. Abstracts of papers can be sent to J. E. Goldman, Scientific Laboratory, Ford Motor Co., P. O. Box 2053, Dearborn, Mich.

Rare Earth Metals — A new data sheet on rare earth metals has been prepared by Research Chemicals Division, Nuclear Corp. of America, and is now available from Research Chemicals Division, Nuclear Corp. of America, P. O. Box 431, 170 W. Providencia St., Burbank, Calif.

Copper-Plating Agent—The Seymour Manufacturing Co., Seymour, Conn., has been awarded a patent on "Cu-Sol", a copper-plating agent with excellent "throwing" power which permits smooth surface copper plating to any thickness.

Metalworking Technique—Alcoa has anounced a metalworking technique for lateral impact extrusion which is capable of instantaneous and complete fabrication of complex shapes like faucet handles and the hub and spokes of a steering wheel.

Calumet Awards Lucas Scholarships

Shown During the Presentation Ceremonies of Two R. B. Lucas Memorial Scholarships by the Calumet Chapter Are, From Left: H. M. Hightower, Counselor, Hammond High School; James Kalan, Hammond High School Award Winner; Brent Dickson, Hobart High School Award Winner; Marion Bailey, Guidance Director, Hobart High School; and E. S. Cisco, Scholarship Committee Chairman, Calumet Chapter. The scholarships, which carry a $400 stipend, are awarded on the basis of high-school scholastic record, need and character, to students wishing to study engineering

EMPLOYMENT SERVICE BUREAU

The Employment Service Bureau is operated as a service to members of the American Society for Metals and no charge is made for advertising insertions. The "Positions Wanted" column, however, is restricted to members in good standing of the A.S.M. Ads are limited to 50 words and only one insertion of any one ad. Address answers: c/o A.S.M., Metals Park, Novelty, Ohio, unless otherwise stated.

POSITIONS OPEN

East

METALLURGIST: Experienced, for practical research and control on nickel and nickel-chromium alloys. Must be able to investigate complaints and develop cures for problems involving high temperatures and corrosion resistance along with electrical resistance. Send resume and salary requirements in confidence. Box 10-100.

SALES ENGINEER: Experienced, for nickel-chromium electrical resistance wire and other nickel alloy wire, rod and strip. Good opportunities for above average income and advanced responsibilities with progressive company. Salary and incentive program. Territories open in New Jersey-New York, Connecticut, Massachusetts, Rhode Island. Box 10-105.

Alco Products, Inc., has openings for experienced engineers in the following capacities: Senior Mechanical Engineers; Senior Stress Analyst; Senior Heat Transfer Engineers; Senior Mechanical Project Engineers; Mechanical Engineers; Senior Manufacturing Development Engineer; Spring Designer. Send resume and salary requirements to: G. Y. Taylor Administrative Services, Alco Products, Inc., Schenectady 5, N. Y.

YOUNG ENGINEER WANTED: The Welding Research Council, a cooperative research organization, requires a young graduate engineer, having at least two years experience, for technical secretary. Opportunities for advancement and experience in research writing and publications and contacts with outstanding scientists and engineers. Send resume of education, experience and background to: Assistant Director, Welding Research Council, 29 W. 39th St., New York 18, N. Y. All replies will be held in confidence.

CERAMIST OR PHYSICAL CHEMIST: Advanced degree in metallurgy, ceramics or physical chemistry, to initiate and supervise small groups engaged in research and development of materials (high-temperature reactions, coatings, powder metallurgy, refractory composite structures, ceramics, fatigue and fracture). Strong company backing. Salary open. Send complete resume to: A. Wilder, Dept. GR-3, Grumman Aircraft Engineering Corp., Bethpage, L. I., N. Y.

ASSOCIATE RESEARCH METALLURGIST: Advanced degree preferred but will consider equivalent experience, with strong background in physical metallurgy. Experience with aluminum alloys desirable. Should be able to plan and conduct investigations involving the constitution and structure of nonferrous alloys and their relation to properties. Will investigate effect of composition, processing and structure on properties of copper and aluminum-base alloys, develop new alloys or modify known alloys to obtain improved combinations of properties. Salary to $8500. Box 10-110.

ASSISTANT RESEARCH METALLURGIST: Metallurgical degree and about two years experience in research or related work. Graduate credits in physical metallurgy helpful. Interest in physical metallurgy and alloy development. To conduct investigations involving development and testing of copper and aluminum-base alloys. Salary to $7500. Box 10-115.

Midwest

PROJECT LEADER (FORGING DEVELOPMENT): With metallurgy or mechanical engineering degree and about five years experience in closed die forging and forging die design. Should be able to direct all phases of forging development project. To develop tools and techniques for the production of closed die press forgings in a variety of metals. Salary to $8500. Box 10-120.

METALLURGIST: Administrative staff opening for college graduate with background as follows: ferrous metallurgist with production experience. Responsibilities include organization of technical classes and supervision of metallurgical education program but does not include teaching. Some travel. Write: Mineral Industries Continuing Education, 101 Mineral Sciences Bldg., Pennsylvania State University, University Park, Pa., giving educational and vocation background.

PRACTICAL METALLURGIST: With knowledge of inspection procedures, production operation routing and heat treating processes on aircraft and missile alloys. Must have good personality as duties will include representation with customers' metallurgists, inspectors and engineers. Will work as assistant to owner and general manager. Salary to $8000. State experience and education. Box 10-125.

PUBLIC RELATIONS REPRESENTATIVE: To make contacts with customers' engineers, metallurgists, inspectors, etc. Must know basic metallurgy and inspection techniques commonly used on aircraft alloys and be able to discuss effects of manufacturing processes, including heat and cold treatments. Give your experience in dealing with public in sales or

RESEARCH METALLURGIST

Expansion program creates immediate opportunity with CRUCIBLE STEEL COMPANY OF AMERICA for Senior Research Metallurgist.

This is an attractive opening on rapidly enlarging staff of the Research Division of one of the largest producers of stainless and high-alloy steels. Applicants must have considerable experience in the stainless and high-temperature alloy field, together with an appropriate graduate degree, preferably Ph.D. Administrative ability and technical accomplishments will be decisive factors in the selection of successful applicant.

Excellent employee benefit programs. Salary commensurate with experience and ability.

Submit complete resume to:

Mr. J. E. Harris
CRUCIBLE STEEL COMPANY OF AMERICA
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RESEARCH METALLURGISTS

The J&L Research Division wishes to add to its staff several professional metallurgists, to broaden the scope of the Corporation's research programs in carbon and stainless steels.

Of specific interest are physical metallurgists (Ph.D., or M.S. with related research experience) to conduct projects in high-temperature materials, alloy development, corrosion, general applied physical and mechanical metallurgy.

Several openings exist also for recent B.S. graduates, in the fields described above and in projects dealing with steelmaking process analysis and development. For the B.S. graduate interested in a permanent research career, Pittsburgh offers unmatched opportunity for continued education at the graduate level.

J&L is fourth-largest in the United States steel industry, making a wide variety of carbon and stainless steel products. The Research Division is located in modern facilities in suburban Pittsburgh.

J&L STEEL

Send resume, in confidence, to John A. Hill
Research and Development Department
Jones & Laughlin Steel Corporation
3 Gateway Center, Pittsburgh 30, Penna.

technical positions as well as education resume. State salary expected. Central Indiana area. Box 10-130.

METALLURGIST: Progressive and growing manufacturer of tungsten carbide has opening for man desiring to move into management phase. Must have good background in metallurgy, particularly in manufacture and applications of tungsten carbide. Prefer man under 45 with degree in metallurgy. We will pay moving expenses. Salary open. Phone or write immediately giving full particulars. All inquiries held in strict confidence. Contact: Personnel Manager, Multi Metals Div., American Saw and Tool Co., 500 E. Main, Louisville 2, Ky.

METALLURGICAL SUPERVISOR: For group engaged in development of pilot plant processing for producing specialty magnetic alloys. Opportunity for imaginative development of new melting and processing techniques to produce alloys of iron with silicon, aluminum, nickel and cobalt of superior properties. Send replies to: C. T. Hamilton, Technical Recruiter, Westinghouse Electric Corp., P. O. Box 128, Blairsville, Pa.

METALLURGIST: B.S. or M.S. in metallurgy or equivalent. Experience in carbon, low-alloy and high-alloy steels desirable. Opportunity for challenging work on forged, rolled and cast products in central research laboratory of nation's largest steel castings producer. Age to 35. Send resume of qualifications to: John A. Rassenfoss, Manager, Manufacturing Research Laboratory, American Steel Foundries, East Chicago, Ind.

West

METALLURGIST: Degree and experience in brazing high-temperature materials. Unusual opportunity in expanding research organization. Medium-size company located in area with outstanding cultural and educational facilities and finest year-around climate in U. S. Send resume to: J. Younie, Solar Aircraft Co., 2200 Pacific Highway, San Diego, Calif.

POSITIONS WANTED

METALLURGISTS: Age 35, married, 3 children, desires position as chief metallurgist, plant metallurgist, superintendent of heat treating. Wide multi-plant experience in heat treating, atmospheres, material specification, furnace equipment, trouble shooting, administration, research, etc. Location not a factor. Box 10-5.

MANAGEMENT-LEVEL METALLURGIST: Knows research, development, trouble shooting. Over half decade experience in management positions in addition to previous top-notch engineering work. Experienced with high-temperature alloys, cast iron, steels, aluminum and reactive metals. Mid 30's, M.S. degree, publications. Small or medium-size company preferred. Box 10-10.

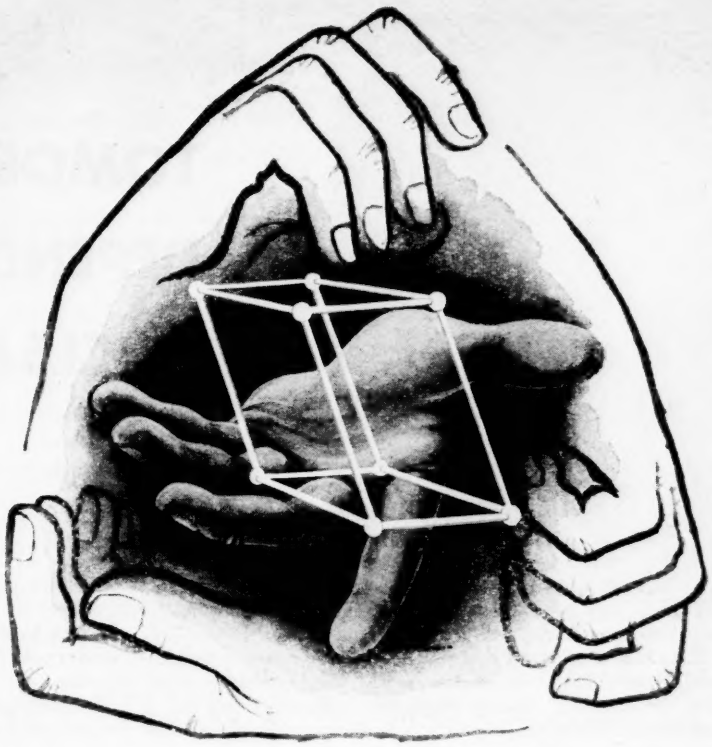
PHYSICAL METALLURGIST, RESEARCH METALLOGRAPHER, MANAGER: M.S. in metallurgy, with background in business administration and electronics. Experienced in planning, development and management of metallurgical laboratory. Desires career position in research and development laboratory administration. Age 29, married, family, veteran, citizen. Box 10-15.

METALLURGIST: Age 46, B.S. degree, married. Formerly chief metallurgist in aircraft plant. Thirteen years as maanger of commercial heat treating plants. Steel mill experience. Recent heat treating experience in treatment of high-strength and corrosion-resistant steels in aircraft. Box 10-20.

METALLURGIST: Young, seeks position overseas. Five-year B.S. degree in metallurgical engineering. Three years experience includes research and production in metal extraction field and production of aircraft. Resume sent upon request. Box 10-25.

SALES ENGINEER: B.S. degree in chemistry, graduate work in metallurgy. Age 40, with 14 years industrial sales experience with two manufacturers of diversified ferrous and nonferrous alloys and alloy products. Previous four years supervisory experience in major plant production and research. Free to travel if residence in or near Metropolitan New York City can be maintained. Box 10-30.

MECHANICAL ENGINEER: B.S. degree and business administration and technical courses. Methods improvement and manufacturing engineering, tooling supervisor, supervised research and development of metal forming process, small appliance design and development, automatic machine design and development, materials and process, patents, creative. Desires challenge in East. Box 10-35.



TO A METALLURGIST'S METALLURGIST

If your knowledge and interests are in the complex area of reactor core material development and fabrication, then you will be interested in the Atomic Power Department of Westinghouse, where your ability to solve the problems involved in this aspect of nuclear technology will play an important part in the overall effort to make atomic power available to all of industry.
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SENIOR METALLURGIST . . . Minimum of three years in reactor field preferably in materials application or materials irradiation. To study the changes resulting from irradiation in the properties of reactor core materials.

METALLURGIST . . . With at least one year in reactor core materials technology field. Materials development for fuel element prototypes. Testing and evaluation of fabrication methods for fuel elements.

Send resumé to Mr. C. S. Southard, Westinghouse Atomic Power Dept., P.O. Box 355, Dept. **W-25**, Pittsburgh 30, Pa.

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Now you can learn, from David Lillie, many aspects of currently available information about the role of special metals in the realm of nuclear power.

And keep this in mind as you read on—*Metals for Nuclear Power* contains *authoritative* material, *current* material, *valuable* material. It was written by an expert. It is offered by the Metals Engineering Institute—a division of the American Society for Metals, a respected and honored Society with *forty years* of educational success in the metal industry.

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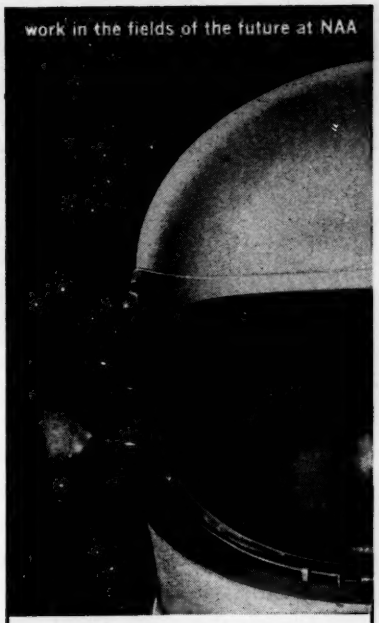

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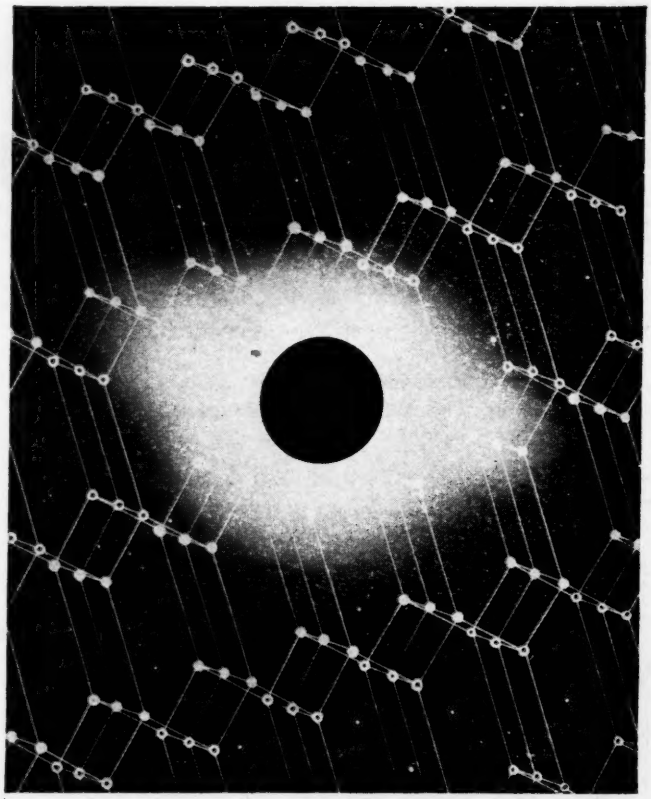

CERAMISTS who value the opportunity to do original work with a company that fosters free inquiry and initiative, are invited to inquire about positions now open in the areas to the left. Please include salary requirements with resume.

Write to Mr. P. W. Christos, Div.

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METALLURGIST: B.S. degree, age 38, married, family. Chief metallurgist for three years for engine manufacturer. Six years assistant chief metallurgist and experimental metallurgist, 3½ years as research metallurgist and customer service metallurgist in copper and brass mill. Experience in ferrous, nonferrous and high-temperature alloys, parts failure analysis, physical testing, metallography, heat treatment, materials specification, material assignment, metallurgical processes. Familiar with engine design. Box 10-40.

CHEMIST-METALLURGIST: Ph.D. in chemistry, research and development in powder metallurgy, high-temperature materials, hard metals, cermets. Fourteen years in last job when company closed. Numerous publications on carbides and borides, including analysis procedures for borides. Desires position as chemist or metallurgist in New York area. Box 10-45.

METALLURGICAL ENGINEER: Good, responsible, available for challenging management position. Thirteen years experience in research and pilot plant development, six years supervisory and administrative. Physical and vacuum process metallurgy of high-temperature, reactive and refractory-base alloys. Veteran, married, family. $15,000 minimum. Box 10-50.

METALLURGIST: With 20 years diversified experience in metal fabrication and development work. Heat treat specialist on ferrous and nonferrous materials. Extensive experience in production trouble shooting, service failure analysis, metallography, laboratory management, technical writing. College trained in metallurgy and chemistry. Age 51. Resume on request. Location open. Box 10-55.

INVESTMENT CASTING SUPERINTENDENT OR MANAGER: Age 34, nine years experience in all phases of investment casting, process development and production. Experience in high-temperature alloy preparation, ceramic shell process. Present salary over $10,000. Prefers Midwest, but would consider relocating for more responsible and challenging position. Box 10-60.

METALLURGIST: B.S. in metallurgy, graduate study, age 28, single. Six years experience in development, selection and specification of metallic materials and processes, failure analyses, trouble shooting, metallographic investigation. Desires position of responsibility and growth within commuting range of New York City with small to medium-size company. Box 10-65.

METALLURGICAL ENGINEER: B.M.E. degree, experienced in all phases of aircraft joining in production and in research and development. Also has some experience in joining of nuclear metals. Will relocate. Box 10-70.

MATERIALS ENGINEER: B.S. degree, age 29, married, family. Five years research and development experience in nonferrous fields including electroplating, corrosion testing, irradiation testing and evaluation, powder metallurgy, induction melting, arc melting, mechanical design, materials selection and evaluation,

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ASSISTANT RESEARCH METALLURGIST (Bridgeport, Conn.)

Metallurgical degree. About 2 yrs. experience in research or related work. Interest in physical metallurgy and alloy development. Conduct research involving development and testing of copper and aluminum-base alloys.

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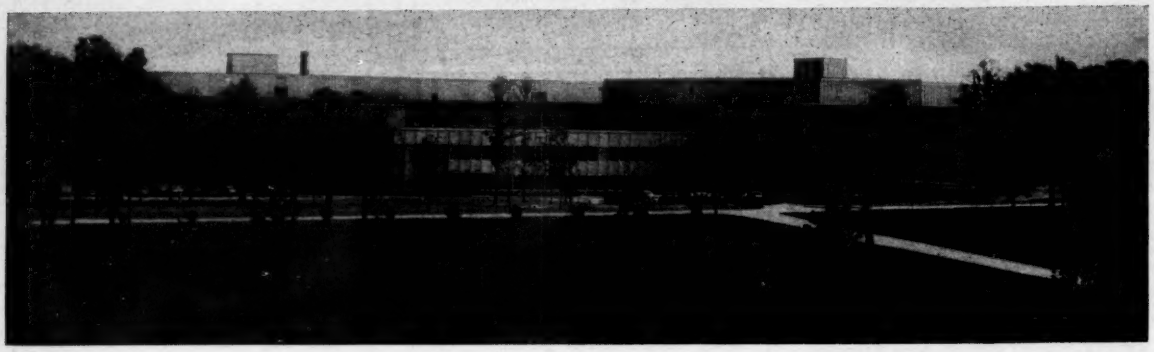

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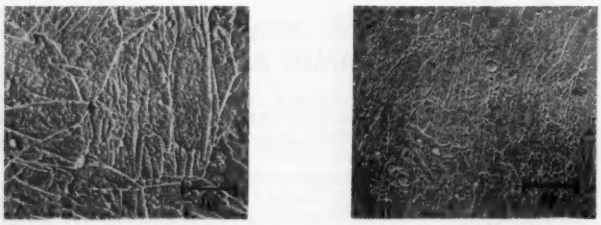
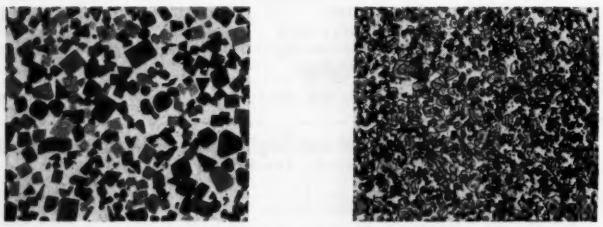
The Scientific Laboratory announced recently two new materials developed by such an approach.

BASIC RESEARCH

Scientists interested in the nature and properties of surfaces, the deformation of nonmetallic solids, thermodynamics and kinetics, or dislocation theory are especially needed. Basic research is presently being carried on in calorimetry, metal solidification, recrystallization textures, plastic deformation, phase transformations, diffusion, and interfacial energies of solid-solid and solid-liquid systems. A substantial staff of theoretical and solid state physicists is available for consultation and collaboration.



By evoking current knowledge of the effects of plastic deformation on the kinetics of isothermal decomposition, ultra high strength steels with tensile strengths near one-half million psi were developed with as much as eight percent elongation. Electron micrographs at X15000 magnification show conventional (left) and Scientific Laboratory steels (right). Quantitative measurements of the fine martensitic microstructure shown in the new steels correlate with yield and fracture stresses in accordance with theories of brittle fracture.



A basic study of the interfacial energy of liquid metal-solid ceramic substrates had led to the development of new microstructures. Cermets having these microstructures possess unusual properties. Decrease of solid-liquid interfacial energy by compositional control has resulted in TiC-nickel molybdenum bonded cermets which exhibit remarkable cutting tool characteristics. The microstructure on the left (TiC-nickel bonded) demonstrates the structure obtained with partial wetting of the solid by the liquid while that on the right (TiC-nickel molybdenum bonded) exhibits the fine particle size and thin metal film requisite for superior mechanical and cutting tool behavior.

Members of our Scientific Staff will be attending the National Metal Congress with rooms at the Sherman Hotel, Saturday through Friday, October 31 to November 6, 1959.

Contact E. D. Marande, C. W. Phillips, V. F. Zackay, or leave message at their hotel, if preferred. A resume of education and experience can be sent to:

E. D. Marande, Manager
Metallurgy Department
Scientific Laboratory
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We need an Einstein in metallurgy to be able to see into 5 or 6 dimensional space —and some genius—and he would have to be a very great one, to predict what phase constitution in such systems would be, if the fearful amount of the currently necessary experimental work is to be avoided. And we need still another genius to foretell, after all this, how oxidation resistance can at the very same time be provided."

Robert F. Mehl
Dean of Graduate Studies
Carnegie Institute of Technology

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PRECIPITATION REACTIONS IN IRONS AND LOW-ALLOY STEELS
H. W. Paxton, Assistant Professor, Metallurgy Dept., and Member of Staff, Metals Research Laboratory, Carnegie Institute of Technology

PRECIPITATION REACTIONS IN IRON-BASE ALLOYS
A. J. Lena, Manager, Basic Research Dept., Research and Development Lab., Allegheny Ludlum Steel Corporation

PRECIPITATION HARDENING OF COPPER ALLOYS
W. D. Robertson and Robert S. Bray, Hammond Metallurgical Laboratory, Yale University, and Chase Brass and Copper Company, respectively.

MAGNESIUM ALLOYS
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SOME AGE HARDENING CHARACTERISTICS OF NICKEL-CHROMIUM ALLOYS (NICKEL-RICH) CONTAINING ALUMINUM AND TITANIUM
C. G. Bieber and R. J. Raudebaugh, Research Laboratory of the International Nickel Company

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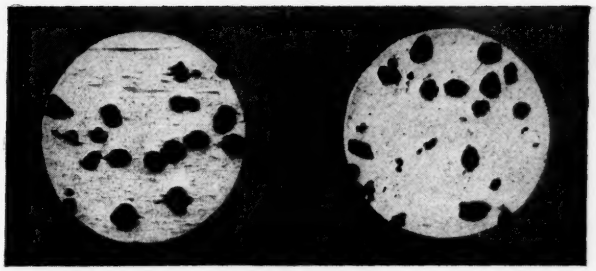
NARROWING THE "DEPARTURE FROM IDEALITY" IN DISPERSION FUEL DEVELOPMENT



† Longitudinal section of 200-μ UO_2 dispersed in Zircaloy matrix. 30X. BF. Reduced approximately 38% for reproduction.

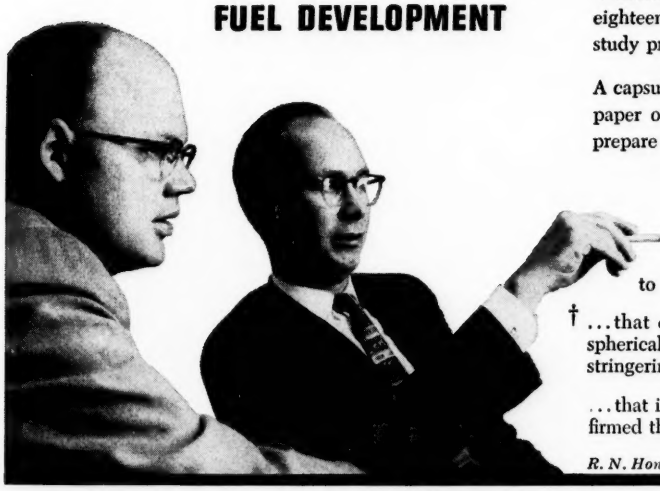
Transverse section of 200-μ UO_2 dispersed in Zircaloy matrix. 30X. BF. Reduced approximately 38% for reproduction.

Scientists have long been cognizant ot the theoretical advantages of applying the dispersion theory to reactor fuel elements. Ideally this concept could be utilized to extend substantially fuel rod life in high performance water cooled reactors.

But it remained for KAPL Metallurgists Dr. A. P. Beard and R. N. Honeyman to solve basic problems of process metallurgy involved and achieve *actual fabrication* of zirconium-alloy base dispersion elements which were a significant step closer to the theoretical ideal.

Encouraged by Dr. C. E. Weber, Manager of Basic Materials Development, and a leading figure in Dispersion Element research – and aided by consultation with specialists in several KAPL laboratories – Beard and Honeyman successfully completed evaluation of the irradiation behavior of their first samples in September 1958, only eighteen months (and 2 volumes of experimental data) after the study program was formally initiated.

A capsule description of their findings appears below. Reprints of a paper outlining the experimental method and techniques used to prepare laboratory samples will be furnished on request.



R. N. Honeyman (l.) and A. P. Beard (r.)

Summary of Findings: Dispersion Fuel Study

...showed that mechanical attritioning could be used to prepare zirconium powder with high corrosion resistance.

† ...that extrusion of dispersions of 200 micron dia. particles of spherical UO_2 & UC could be achieved at 750° C with little or no stringering and no reaction between particles and Zircaloy matrices.

...that irradiation behavior of zirconium base dispersion fuels confirmed theoretical concepts of such systems.

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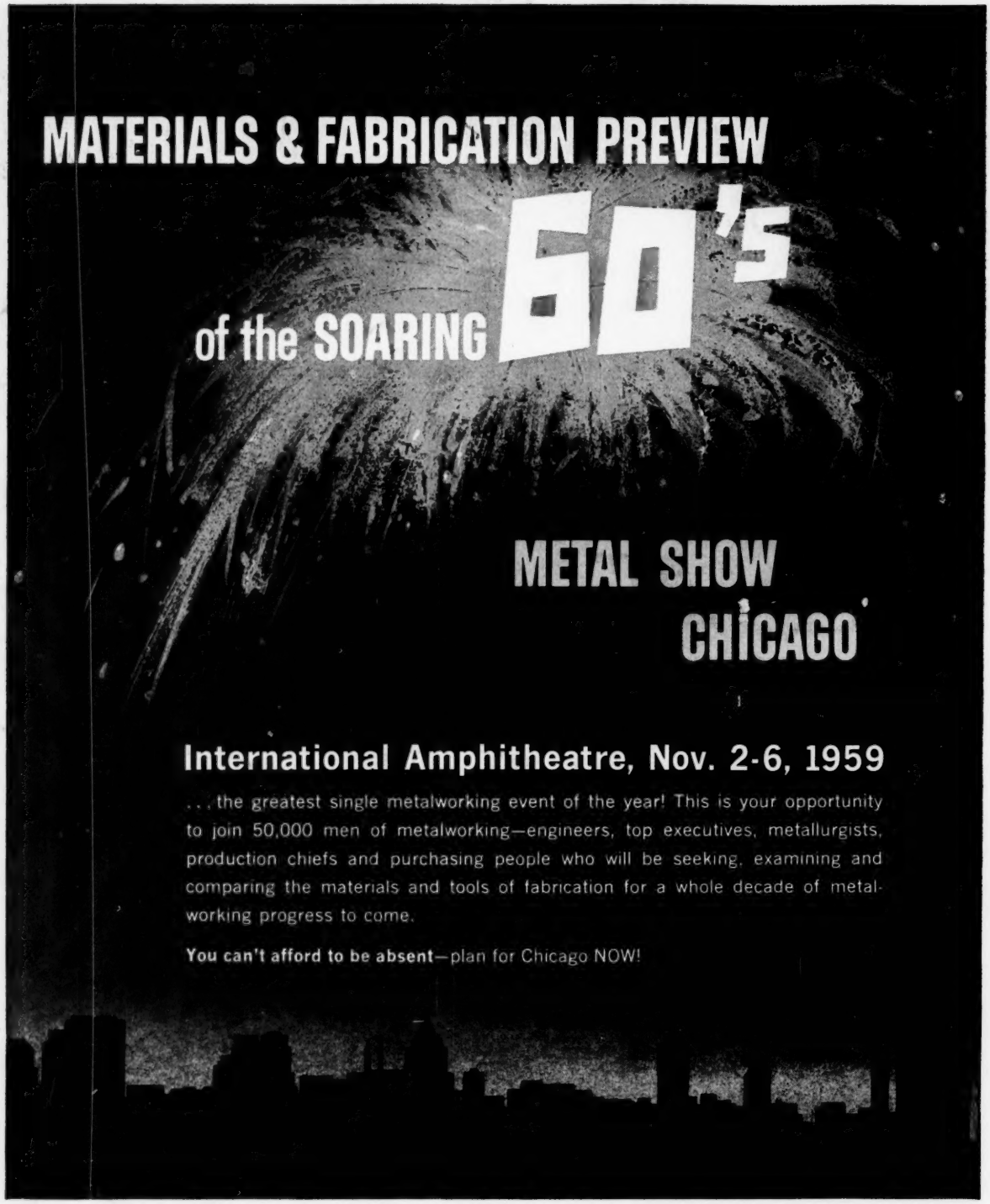
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